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GUIDE TO ABSTRACT WRITING

1. *Purpose.* It is very important that a paper be accompanied by an abstract, preferably appearing at the beginning. This abstract is not part of the paper—it is an adjunct intended to convey briefly the content of the paper, to draw attention to all new information and to the main conclusions. It should be directly informative, not merely indicative.

2. *Style of Writing.* The abstract should be written concisely and in normal rather than abbreviated English. Where possible, standard terms should be used and unnecessary contracting should be avoided. The third person is preferable. Mixed tenses, and both indicative and imperative forms should be avoided.

It should be presumed that the reader has some knowledge of the subject, but has not read the paper. He may not even have the paper available at all, if he is working with the abstract journal only. The abstract should, therefore, be intelligible in itself, without reference to the paper; for example, it should not cite sections or illustrations as a substitute for a statement of their content.

3. *Content.* The title of the paper is usually read as part of the abstract, therefore repetition of the title in the opening sentence of the abstract should be avoided. If the title is insufficiently comprehensive to indicate the subjects covered or the objects of the investigation, the opening sentence should make this clear.

The abstract should state newly observed facts, conclusions of an experiment or argument and, if possible, the essential parts of any new theory, treatment, apparatus, technique, etc.

It should contain the names of any new compound, and any new numerical data, such as physical constants; if this is not possible it should draw attention to them. It is important to refer to new items and observations, even though they may be incidental to the main purpose of the paper.

When giving experimental results, the abstract should indicate the methods used; for new methods, the basic principle, range of operation, and degree of accuracy should be given.

4. *Detail of Layout.* It is impossible to recommend a standard length for an abstract. It should, however, be concise and should not normally exceed 200 words. References should be omitted from the abstract whenever possible.

INTRODUCTION TO

NUCLEAR SCIENCE ABSTRACTS

A Publication of the United States Atomic Energy Commission Technical Information Service

The printing of this publication has been approved by
The Director of the Bureau of the Budget August 2, 1951

Nuclear Science Abstracts is issued twice a month throughout the calendar year by the Atomic Energy Commission. It is intended primarily to serve scientists and engineers working within the Atomic Energy Project by abstracting as completely and as promptly as possible the literature of nuclear science and engineering. It covers not only the unclassified and declassified research reports of the Atomic Energy Commission and its contractors, but also material in its field of interest which appears in technical and scientific journals and unpublished research reports of government agencies, universities, and industrial research establishments.

DECLASSIFICATION

The issuance of these Abstracts does not constitute authority for declassification of any reports.

INDEXES

Nuclear Science Abstracts is indexed by author, subject, and report number. Annual index issues are prepared for each volume, and the next cumulated index will appear in volume 10(1956) covering volumes 5-10. A cumulated index to volumes 1-4 was issued as volume 4, No. 24B, Dec. 30, 1950 covering authors, subjects, nuclides, and report numbers. The 24th number of volumes 5, 6, and 7 contain indexes covering the individual volumes and a cumulated Numerical Index of Reports covering Abstracts of Declassified Documents, Vols. 1 and 2, as well as the previously issued NSA volumes.

Each issue of Vol. 8(1954) contains an author index to abstracts in that issue and a regularly cumulated supplement to the Numerical Index of Reports. Subject and author indexes, covering three-, six-, and nine-month periods, are issued as supplements to the sixth, twelfth, and eighteenth issues. The 24th issue is the annual index for the volume.

In addition to conventional abstracts, Nuclear Science Abstracts carries in its quarterly index issues (6B, 12B, 18B, and 24B) lists of New Nuclear Data in which experimental results are displayed in tabular form and arranged by element and isotope. Each data item includes a reference. In 1954 these lists will be cumulated at every quarter until the end of the year. New Nuclear Data is compiled by the Nuclear Data Group of the National Research Council, Washington 25, D. C. The data items are also supplied by this group on 3 × 5" cards for $20.00 per year domestic and about $30.00 per year foreign (air mail postage included).

AVAILABILITY

Nuclear Science Abstracts is available as single copies (25 cents each for regular issues; 60 cents for the annual index issue) or by subscription ($6.00 a year domestic; $8.00 a year foreign) from the

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RESEARCH AND DEVELOPMENT REPORTS

How to Locate Reports. The Numerical Index of Reports appearing in each issue indicates the declassified and unclassified research reports which have been abstracted in the current volume of Nuclear Science Abstracts.

Information regarding other AEC reports which have been abstracted is available in the cumulative Numerical Index of Reports in Nuclear Science Abstracts, Vol. 7, No. 24A, Dec. 31, 1953, or the cumulative supplements to this index which appear in each issue of this volume.

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scale that four pages approximate an ounce. It is the purchaser's responsibility to compute the necessary postage, as rates vary for different countries.

Reports Available Elsewhere. Many of these reports are, or will be, published in scientific and technical journals, or in volumes of the National Nuclear Energy Series. A journal citation is given in the Numerical Index of Reports for reports already published.

Reports Not Published. AEC reports for which no sale price or literature citation is given are obtainable on loan at the depository libraries. The complete series (NSF-tr) of National Science Foundation translations is also available at the depository libraries.

Non-AEC Reports. Reports prepared by organizations not under contract to the AEC should be requested from the issuing agency indicated in the descriptive cataloging. NP-series reports should be requested by author and title, as these numbers are applied by the AEC for internal convenience only.

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General Information on Location of Reports. If the searcher knows the report number, he should look in the Numerical Index of Reports of NSA, Vol. 7, No. 24A, Dec. 31, 1953, or in the supplements in later individual issues. If the searcher does not know the report number, searching is aided by the annual or cumulated subject and author indexes. The indexes refer to an abstract from which the report number may be noted, and the information regarding availability can then be obtained from the Numerical Index of Reports. Declassified reports numbered MDDC and AECD through 2023 are indexed by subject and author in the separate, Declassified Documents Cumulated Index, and their abstracts appear in Abstracts of Declassified Documents, the forerunner to NSA. These publications as well as the first five volumes of NSA are now out of print but may be consulted at the AEC depository libraries.

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NUCLEAR SCIENCE ABSTRACTS

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CALENDAR OF MEETINGS

Suggestions for additions to this list will be welcomed and should be sent with all pertinent information to the Cataloging Branch, Technical Information Service, U. S. Atomic Energy Commission, P. O. Box 62, Oak Ridge, Tennessee.

June 20-25, 1954

NUCLEAR ENGINEERING CONFERENCE, University of Michigan, Ann Arbor, Michigan, Sponsored by: American Institute of Chemical Engineers.

Inquiries should be addressed to: Professor Donald Katz, University of Michigan, Department of Engineering, Ann Arbor, Michigan.

July 19-24, 1954

SECOND RADIOISOTOPE CONFERENCE (a conference on the peaceful uses of atomic energy), Oxford, England,
Arranged by: The Atomic Energy Research Establishment, Harwell.

Inquiries should be addressed to: The Conference Secretary, Atomic Energy Research Establishment, Harwell, Didcot, Berks, England.

ERRATUM

NSA, Vol. 8, No. 2, p. 73. In abstract 619, KAPL-1005 should be AECU-2809.

SELECTED SUBJECTS OF INTEREST TO INDUSTRY

All AEC reports abstracted in this issue of Nuclear Science Abstracts have been reviewed and evaluated in terms of their interest and usefulness to general industry. These reports are listed below by title, author, and report number under one or more of the following nine broad categories: Chemistry and Chemical Engineering; Construction and Civil Engineering; Electronics and Electrical Engineering; Health and Safety; Industrial Management; Mechanics and Mechanical Engineering; Metallurgy and Ceramics; Mining and Geology; and Nuclear Technology. The abstract number for each report is listed at the upper right of the entry and refers to an item in the current issue of NSA.

All unclassified reports considered to be of special interest to general industry issued by the AEC prior to July, 1953 are listed or abstracted in a series of bibliographies (TID-3050), the titles of which correspond to the above-mentioned categories. As these background bibliographies become available for sale, the prices will appear in the Numerical Index of Reports which is included in each issue of this volume of NSA. These bibliographies may be purchased from the U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.

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CHEMISTRY AND CHEMICAL ENGINEERING

AECD-3615 2253
Hanford Works
SOME ASPECTS OF GRAPHITE MODERATED REACTOR COOLING. [G. M. Roy and G. Locke]. [May 21, 1953]. Decl. with deletions Dec. 28, 1953. 7p. (AECD-3615)

ANL-5183 2256
Argonne National Lab.
DETERMINATION OF URANIUM BURNUP BY NOMOGRAPHS. F. R. Taraba. Dec. 1953. 8p. Contract W-38-109-eng-38. (ANL-5183)

ANL-5224 2120
Argonne National Lab.
THIOCYANATE SPECTROPHOTOMETRIC DETERMINATION OF MOLYBDENUM AND TUNGSTEN. C. E. Crouthamel and C. E. Johnson. Feb. 1954. 27p. Contract No. W-31-109-eng-38. (ANL-5224)

BMI-899 2163
Battelle Memorial Inst.
EVALUATION OF PERFORMANCE OF A MODEL HIGH-PRESSURE BOILER. D. D. Foley, R. Q. Wilson, and R. B. Filbert, Jr. Jan. 26, 1954. 18p. Contract W-7405-eng-92. (BMI-899)

CU-1-53-At-dP-Ch.E. 2172
Columbia Univ.
BIBLIOGRAPHY ON THE CORROSION OF ALUMINUM IN WATER. R. S. MacCormack, S. S. Dayan, H. Paige, and H. Weinshelbaum. July 1953. Contract AT(07-2)-1, DuPont Subcontract AX 294. (CU-1-53-At-dP-Ch.E.)

ISC-358 2159
Ames Lab.
THE PREPARATION, PURIFICATION AND SOME ANALYTICAL APPLICATIONS OF $\alpha, \beta, \gamma, \delta$-TETRAPHENYLPORPHINE. John Howard Priesthoff and Charles V. Banks. June 1953. 42p. Contract W-7405-eng-82. (ISC-358)

ISC-424 2268
Ames Lab.
A LOW TEMPERATURE DILATOMETRIC STUDY OF SOME RARE EARTH METALS. F. Barson, S. Legvold, and F. H. Spedding. Aug. 1953. 64p. Contract W-7405-eng-82. (ISC-424)

KAPL-961 2148
Knolls Atomic Power Lab.
A MINIATURE MIXER SETTLER FOR CONTINUOUS COUNTERCURRENT SOLVENT EXTRACTION. H. Ward Alter, James W. Codding, and Alfred S. Jennings. Nov. 25, 1953. 39p. Contract W-31-109-Eng-52. (KAPL-961)

ORNL-1599 2265
Oak Ridge National Lab.
MAGNETIC SUSCEPTIBILITY OF ANNEALED AND FAST-NEUTRON BOMBARDED GERMANIUM. D. K. Stevens. Mar. 4, 1954. 37p. Contract No. W-7405-eng-26. (ORNL-1599)

ORNL-1673 2110
Oak Ridge National Lab.
PREPARATION OF HIGH-PURITY, ANHYDROUS LITHIUM IODIDE. Ray H. Sampley. Mar. 3, 1954. 12p. Contract No. W-7405-eng-26. (ORNL-1673)

UCLA-279 2149
Atomic Energy Project, Univ. of Calif., Los Angles
A NEW APPROACH TO THE SEPARATION OF FATTY ACIDS DIFFERING IN DEGREE OF UNSATURATION. David R. Howton. Feb. 19, 1954. 30p. Contract AT-04-1-GEN-12. (UCLA-279)

UCRL-2416 2111
Radiation Lab., Univ. of Calif., Berkeley
A THERMODYNAMIC STUDY OF GASEOUS OXIDES (thesis). Richard Francis Porter. Dec. 1953. 46p. Contract W-7405-eng-48. (UCRL-2416)

UR-293 2161
Atomic Energy Project, Univ. of Rochester
SPECTROPHOTOMETRIC STUDIES OF THE URANYL-LACTATE, -MALATE, AND -TARTRATE SYSTEMS IN ACID SOLUTION. Isaac Feldman and Jean Havill. Dec. 2, 1953. 15p. Contract W-7401-eng-49. (UR-293)

CONSTRUCTION AND CIVIL ENGINEERING

AECU-2755 2254
Knolls Atomic Power Lab.
ENGINEERING DEVELOPMENT PROBLEMS IN ATOMIC POWER PLANTS. G. S. Mikhalapov, K. A. Kesselring, and T. Trocki. [1953] 19p. (AECU-2755)

ELECTRONICS AND ELECTRICAL ENGINEERING

ANL-5177 2213
Argonne National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY PROGRESS REPORT FOR SEPTEMBER, OCTOBER, AND NOVEMBER 1953. Dec. 1953. 21p. Contract W-31-109-eng-38. (ANL-5177)

HW-30601 2227
Hanford Works
PHOSPHOR PLATES FOR ALPHA SCINTILLATION COUNTING. G. E. Driver and P. L. Eisenacher. Jan. 21, 1954. 11p. Contract W-31-109-Eng-52. (HW-30601)

HW-30602 2214
Hanford Works
A TRANSISTOR HIGH VOLTAGE POWER SUPPLY. G. E. Driver. Jan. 21, 1954. 11p. Contract W-31-109-Eng-52. (HW-30602)

K-1099 2212
Carbide and Carbon Chemicals Co. (K-25)
PROPERTIES OF THERMAL CONDUCTIVITY CELLS WITH HEAVY GASES. H. S. McKown. Jan. 29, 1954. 19p. Contract W-7405-eng-26. (K-1099)

LRL-95 2228
Livermore Research Lab., Calif. Research and Development Co.
NEUTRON DETECTOR PERTURBATIONS. S. H. Fitch and J. E. Drummond. Feb. 1954. 25p. Contract AT(11-1)-74. (LRL-95)

NAA-SR-267 2215
North American Aviation, Inc.
THE CALIBRATION OF A HIGH TEMPERATURE RADIATION CALORIMETER. R. J. Graydon and R. L. Carter. Feb. 15, 1954. 25p. Contract AT-11-1-GEN-8. (NAA-SR-267)

ORNL-1542 2216
Oak Ridge National Lab.
A HIGH TEMPERATURE X-RAY CAMERA. J. R. Johnson. Feb. 25, 1954. 11p. Contract W-7405-eng-26. (ORNL-1542)

ORNL-1657 2232
Oak Ridge National Lab.
ROTATING PRISM FOR USE WITH CLOUD CHAMBERS. Bernard G. Saunders. Feb. 15, 1954. 13p. Contract W-7405-eng-26. (ORNL-1657)

HEALTH AND SAFETY

KAPL-864 2140
Knolls Atomic Power Lab.
A PERFORMANCE STUDY OF LABORATORY FUME HOODS. C. G. Detwiler. Jan. 1954. 21p. Contract No. W-31-109 Eng-52. (KAPL-864)

NYO-4565 2231
New York Operations Office, AEC
MIXED BETA-GAMMA EXPOSURES IN FILM BADGE DOSIMETRY. Leonard R. Solon. Dec. 1953. 7p. (NYO-4565)

ORNL-1691 2221
Oak Ridge National Lab.
THE INVENTORY OF ELECTROMAGNETICALLY ENRICHED ISOTOPES. C. P. Keim, C. E. Normand, and Boyd Weaver. Mar. 5, 1954. 47p. Contract No. W-7405-Eng-26. (ORNL-1691)

UCRL-2369 2102
Radiation Lab., Univ. of Calif., Berkeley
THE PATH OF CARBON IN PHOTOSYNTHESIS. 21. THE CYCLIC REGENERATION OF CARBON DIOXIDE ACCEPTOR. J. A. Bassham, A. A. Benson, Lorel D. Kay, Anne Z. Harris, A. T. Wilson, and M. Calvin. Oct. 1953. 42p. Contract W-7405-eng-48. (UCRL-2369)

UCSF-8 2091
Radiological Lab., Univ. of Calif., San Francisco, School of Medicine
ANNUAL REPORT [FOR] 1953. 70p. Contract AT-11-1-GEN-10. (UCSF-8)

INDUSTRIAL MANAGEMENT

ORO-109 2097
Oak Ridge Inst. of Nuclear Studies
TELETHERAPY DESIGN PROBLEMS. COBALT^{60} TELETHERAPY UNIT. QUARTERLY PROGRESS REPORT [FOR] JULY 1–SEPTEMBER 30, 1953. Marshall Brucer, Herbert D. Kerman, and J. E. Richardson. 56p. Contract AT-40-1-GEN-33. (ORO-109)

METALLURGY AND CERAMICS

BMI-901 2171
Battelle Memorial Inst.
CORROSION OF STAINLESS STEELS IN SUPERCRITICAL WATER. H. A. Pray and W. K. Boyd. Feb. 4, 1954. 20p. Contract W-7405-eng-92. (BMI-901)

CU-1-53-At-dP-Ch.E. 2172
Columbia Univ.
BIBLIOGRAPHY ON THE CORROSION OF ALUMINUM IN WATER. R. S. MacCormack, S. S. Dayan, H. Paige, and H. Weinshelbaum. July 1953. Contract AT(07-2)-1, DuPont Subcontract AX 294. (CU-1-53-At-dP-Ch.E.)

KAPL-1011 2182
Knolls Atomic Power Lab.
DETERMINATION OF FERRITE IN TYPE 347 STAINLESS STEEL WELD DEPOSITS. W. L. Fleischmann. Nov. 11, 1953. 69p. Contract W-31-109-Eng-52. (KAPL-1011)

KAPL-1037 2264
Knolls Atomic Power Lab.
INTERSTITIAL CONTENT OF RADIATION DAMAGED METALS FROM PRECISION X-RAY LATTICE PARAMETER MEASUREMENTS. 1. PRINCIPLES OF THE MEASUREMENTS. C. W. Tucker, Jr. and J. B. Sampson. Jan. 26, 1954. 22p. Contract No. W-31-109 Eng-52. (KAPL-1037)

NAA-SR-835 2201
North American Aviation, Inc.
THE DEBYE TEMPERATURE OF $AuCu_3$ AS A FUNCTION OF LONG RANGE ORDER PARAMETER. D. B. Bowen. Nov. 30, 1953. 12p. Contract AT-11-1-GEN-8. (NAA-SR-835)

NYO-3649 2169
Massachusetts Inst. of Tech.
THE MEASUREMENT OF THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS—CARBIDES AND NITRIDES. T. Vasilos, W. D. Kingery, and F. H. Norton. Dec. 30, 1953. 33p. Contract AT(30-1)-960. (NYO-3649)

NYO-7037 2186
Massachusetts Inst. of Tech.
THERMODYNAMIC PROPERTIES OF SOLID ALUMINUM-ZINC ALLOYS. J. E. Hilliard, B.L. Averbach, and Morris Cohen. Dec. 1, 1953. 41p. Contract AT(30-1)-1002, Scope 2, Technical Report No. 18. (NYO-7037)

NUCLEAR TECHNOLOGY

AECD-3615 2253
Hanford Works
SOME ASPECTS OF GRAPHITE MODERATED REACTOR COOLING. [G. M. Roy and G. Locke]. [May 21, 1953]. Decl. with deletions Dec. 28, 1953. 7p. (AECD-3615)

AECU-2755 2254
Knolls Atomic Power Lab.
ENGINEERING DEVELOPMENT PROBLEMS IN ATOMIC POWER PLANTS. G. S. Mikhalapov, K. A. Kesselring, and T. Trocki. [1953] 19p. (AECU-2755)

ANL-5152 2255
Argonne National Lab.
RECALIBRATION OF CP-2 AND ITS USE FOR INHOUR MEASUREMENTS. J. L. Hyde, P. D. Deans, D. J. Pellarin, and G. W. McManaway. Nov. 1953. 25p. Contract W-31-109-eng-38. (ANL-5152)

ANL-5183 2256
Argonne National Lab.
DETERMINATION OF URANIUM BURNUP BY NOMOGRAPHS. F. R. Taraba. Dec. 1953. 8p. Contract W-38-109-eng-38. (ANL-5183)

NAA-SR-839 2257
North American Aviation, Inc.
OPERATION OF A WATER BOILER NEUTRON SOURCE. M. E. Remley. Nov. 20, 1953. 34p. Contract AT-11-1-GEN-8. (NAA-SR-839)

NUCLEAR SCIENCE ABSTRACTS

Vol. 8 Apr. 30, 1954 No. 8

An asterisk preceding the abstract number indicates that the corresponding report is included in the "Selected Subjects of Interest to Industry" section of this issue.

GENERAL

2083

CHICAGO RADIOCARBON DATES, IV. W. F. Libby (Univ. of Chicago). Science 119, 135-40(1954) Jan. 29. (cf. NSA 7-1377)

Data on age of archeological specimens are presented, together with a brief description and history of each specimen. The age determinations are based on a C^{14} half-life of 5568 ± 30 yr. (C.H.)

BIOLOGY AND MEDICINE

2084

Argonne National Lab.

MONTHLY PROGRESS REPORT. REPORT OF THE WORK OF THE BIOLOGICAL AND MEDICAL RESEARCH, RADIOLOGICAL PHYSICS, AND HEALTH SERVICES DIVISIONS FOR THE QUARTERLY PERIOD ENDING DECEMBER 31, 1953. Jan. 1954. 23p. Contract W-31-109-eng-38. (ANL-5200)

2085

Brookhaven National Lab.

CELLULAR MECHANISMS OF PROTEIN METABOLISM IN THE NEPHRON. 2. THE HISTOCHEMICAL CHARACTERISTICS OF PROTEIN ABSORPTION DROPLETS. Jean Oliver, Montrose J. Moses, Muriel C. MacDowell, and Yin Chen Lee. Brookhaven National Lab.; New York State Univ. Medical Center, New York; and Overlook Hospital, Summit, N. J. [1953?] 39p. (BNL-1691)

RADIATION EFFECTS

2086

Hanford Works

THE EFFECT OF TRITIUM OXIDE ON SOME SYNTHETIC PROCESSES OF CHLORELLA PYRENOIDOSA. J. W. Porter and H. J. Knauss. Dec. 29, 1953. 12p. Contract No. W-31-109-Eng-52. (HW-30252)

Chlorella were grown for 3 days in the presence of 20 mc/ml of tritium oxide. Then the cells were grown for 30 hr in non-radioactive inorganic nutrient solution in the presence of tracer quantities of C^{14} bicarbonate. The cells were fractionated into several gross fractions, and aliquots were plated and counted for radioactivity. C^{14} contents in each fraction were compared with those in identical fractions of unirradiated control cells. Irradiated cells synthesized 2 to 8 times as much triglycerides as control cells. The irradiated cells also incorporated more C^{14} into the nucleic acid fraction, and less into the chlorophyll a fraction, than did unirradiated control cells. Implications of the results are discussed. (auth)

2087

Naval Medical Research Inst., Bethesda

THE USE OF SMALL LABORATORY ANIMALS IN MEDICAL RADIATION BIOLOGY. 3. REPRODUCIBILITY OF THE LETHAL EFFECT OF TOTAL-BODY IRRADIATION IN MICE. Friedrich Ellinger, Jasper E. Morgan, and Ellsworth B. Cook. Nov. 24, 1953. 8p. (NM-006-012.04.65)

2088

School of Aviation Medicine

THE ANTIBODY RESPONSE OF ANIMALS EXPOSED TO X-RADIATION. (Project No. 21-47-002, Report No. 1). Roland B. Mitchell, Gale H. Keyes, Dorothy T. Anderson, Allyn W. Kimball. Aug. 1950. 11p. (NP-1883)

2089

Atomic Energy Medical Research Project, Western Reserve Univ.

THE DIFFERENTIAL EFFECT OF X-IRRADIATION ON THE INCORPORATION OF DESOXYRIBONUCLEIC ACID PRECURSORS. Helen Harrington and Paul S. Lavik. Feb. 1, 1954. 17p. Contract W-31-109-eng-78. (NYO-4023)

The effect of irradiation on the incorporation of P^{32}, orotic acid-2-C^{14}, adenine-8-C^{14}, and Na formate-C^{14} into the DNA of rat thymus has been studied. The labeled compounds were injected 0.5 hr after the administration of 100 r whole-body x irradiation. Twenty-four hours later the irradiated animals, along with similar control animals, were sacrificed, and the DNA was isolated from the thymus glands. The DNA purines and pyrimidines were then separated and purified by ion exchange and paper chromatography, and their specific activities were determined. It was found that the irradiation markedly and consistently inhibited the incorporation of P^{32} into DNA phosphorus, of orotic acid-2-C^{14} into DNA pyrimidines, and of sodium formate-C^{14} into DNA guanine. However, the incorporation of adenine-8-C^{14} into DNA purines was not inhibited, and even appeared to be above normal in some instances. The radiation had no significant effect on the incorporation of formate-C^{14} into DNA thymine or adenine. Some possible explanations for the differential effect of irradiation on the utilization of these precursors have been suggested. (auth)

2090

Radiation Lab., Univ. of Calif., Berkeley

MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] JULY, AUGUST, SEPTEMBER, 1953. Nov. 27, 1953. 38p. Contract No. W-7405-eng-48. (UCRL-2418)

Studies are reported of the metabolism and tissue distribution in rats of Ce, Tm, and Ra, in which Ce^{144}, Tm^{170}, and Ra^{223} were used as tracers. Details of the isolation of At^{211} from a Bi target following its bombardment with α particles from the 60-in. cyclotron are described. Data are reported from studies of the chronic histopathological effects of injected At^{211} in rats, with particular attention being paid to thyroid and parathyroid tissues, and chronic At^{211} toxicity experiments on monkeys. Data are included from studies of the radiation chemistry of acetic acid. Methods are described for the determination of glyoxylic acid and of

glycolic acid in irradiated aqueous solutions of acetic acid. Preliminary results are reported from a study of the effects of dissolved O in irradiated aqueous acetic acid solutions. Evidence is presented to show that the x-ray-induced lethal mutation frequency of haploid yeast is not altered by hydrostatic pressures reaching 10,000 psi. From the evidence it is inferred that this mutation process does not initially involve macromolecular unfolding. (For preceding period see UCRL-2345.) (C.H.)

*2091

Radiological Lab., Univ. of Calif., San Francisco, School of Medicine

ANNUAL REPORT [FOR] 1953. 70p. Contract AT-11-1-GEN-10. (UCSF-8)

Separate abstracts have been prepared on two sections of this report. (C.H.)

2092

Radiological Lab., Univ. of Calif., San Francisco, School of Medicine

HEMATOLOGY AND RADIOIODINE SECTIONS. p.27-67 of ANNUAL REPORT [FOR] 1953. 45p. Contract AT-11-1-GEN-10. (UCSF-8(p.27-67))

Problems associated with the counting of blood platelets were investigated, and counting methods are discussed. The terminating activities of a project for the study of the hematological effects of total-body irradiation and of a radioiodine project are reported. Bone marrow specimens from patients who had received therapeutic doses of I^{131} were examined. Abnormalities observed are described, and an attempt is made to correlate damage with the amount of I^{131} received. Studies associated with the problem of cancer of the thyroid and related problems of thyroid physiology, I^{131} metabolism, and thyroid pathology are discussed. Data are summarized from follow-up examinations of 175 patients treated with I^{131} for hyperthyroidism and 118 patients with proved cancer of the thyroid, 14 of whom were given I^{131} for the purpose of producing thyroid ablation and 21 of whom received I^{131} for definitive therapy. (C.H.)

2093

Atomic Energy Project, Univ. of Rochester

EFFECTS OF DAILY LOW DOSES OF X-RAYS ON SPERMATOGENESIS IN DOGS. George W. Casarett. Nov. 25, 1953. 67p. Contract W-7401-eng-49. (UR-292)

In this study of the effects of daily low whole-body doses of x radiation for an indefinite time on spermatogenesis in dogs, the semen of 40 irradiated and 20 control beagle dogs was examined periodically for concentration and absolute numbers of spermatozoa, numbers of motile sperm and live sperm, numbers of various types of abnormal sperm, and for pH. A decline in absolute sperm count was first observed after 20 weeks (60 r) and reached lowest levels generally after about 60 weeks (180 r) of exposure. Data on semen analysis and results of test breeding are tabulated. (C.H.)

2094

Atomic Energy Project, Univ. of Rochester

RECOVERY FROM RADIATION INJURY IN MICE AND ITS EFFECT ON LD_{50} FOR DURATIONS OF EXPOSURE UP TO SEVERAL WEEKS. H. A. Blair. Feb. 10, 1954. 22p. Contract W-7401-eng-49. (UR-312)

It is concluded that the lethality of x and γ irradiation applied for various durations from short times up to a few weeks is representable by an appropriate solution of the differential equation $dI/dt = A\gamma - \beta(I - \alpha\gamma t)$ in which I is injury, γ the dose rate, t the time of exposure and A, β, and α are constants. The condition for LD_{50} is that $I = S_0 = A\sigma$ in which S_0 is the median life expectancy of the sample of animals and σ is the LD_{50} for the acute dose. The equation is tested on two sets of data on mice. Solutions of the same equation were shown previously (UR-206, UR-207, and UR-274) to represent data on chronic irradiation. The only known inadequacy of this formulation is its failure to predict that life shortening from single large sublethal doses is greater than from divided doses of the same total magnitude. (auth)

2095

Naval Radiological Defense Lab.

COMBINED EFFECTS OF TOTAL BODY X IRRADIATION AND RADIANT ENERGY THERMAL BURNS. 3. OSMOTIC AND MECHANICAL FRAGILITY OF THE ERYTHROCYTE. E. L. Alpen, J. A. Alexander, A. K. Davis, and W. M. Davis. Nov. 23, 1953. 28p. (USNRDL-419; AFSWP-474)

The osmotic and mechanical fragility of rat erythrocytes have been measured during the 30-day interval following severe and moderately severe burns, 100 and 500 r of whole-body ionizing radiation, and combinations of the two traumata. It has been found that, although it is difficult to demonstrate an increased fragility as early as 4 hr after severe burns, there is most probably an increased resistance to osmotic hemolysis 24 hr later as the result of removal of the most fragile cells. This is a transient finding and normal fragilities are found on the third day. During the recovery period an increased resistance to osmotic hemolysis develops which is discussed as a possible result of increased red cell turnover. Irradiation produces an increased osmotic resistance at the 500-r dose level but not at 100 r. This change is correlated with removal of fragile cells and increased red cell turnover. Combination of the traumata brings about essentially additive results insofar as osmotic fragility is concerned. The mechanical fragility was found to be increased by lethal doses of ionizing radiation and burns when neither trauma was lethal alone. It is thought that the increased mechanical fragility is a sign of impending death in irradiated animals either in the presence or absence of other complicating traumata. (auth)

2096

Naval Radiological Defense Lab.

COMBINED EFFECTS OF TOTAL BODY X IRRADIATION AND RADIANT ENERGY THERMAL BURNS. 2. ANEMIA. A. K. Davis, E. L. Alpen, G. E. Sheline, and W. M. Davis. Nov. 23, 1953. 28p. (USNRDL-423; AFSWP-732)

A comparison of the effects of 25% and 15% body area burns, and 100, 475, and 500 r of total-body x irradiation with the effects of three combinations of these on blood volume, red cell volume, hematocrit, red cell count, hemoglobin, and reticulocyte population has been made in rats. Irradiation with 500 r and a concomitant 15% burn produced values which followed the patterns observed in the rats given 500 r alone; namely, a severe anemia developed with concomitant depression of all the measured values for 15 days. Such a combined injury produced an anemia which developed more rapidly than that caused by 500 r alone. The anemia of the combined injury series was detectable on day 8 and on day 11 was equal to the maximum observed in the irradiated animals on day 15. A discussion of the contribution of such factors to the increased death rate seen in combined injury is given. The erythrocyte values in rats given a 25% burn and 100 r more closely approximated the values of the burned than of the 100 r irradiated rats; namely, there was a rise in blood and plasma volume without an increased red cell volume resulting in a small reduction in hematocrit, hemoglobin, and red cell count. Of the measured values the reticulocyte count proved to be the only useful indicator of exposure to ionizing radiation in low dosage. Even the fall in this variable was obscured by the fifth day in the reticulocytosis characteristic of the burned

rat. The sustained reticulocytosis of the burned rat over the 30 day period with concurrent normal red cell volumes indicates an accelerated rate of red cell destruction during the post-burn period. (auth)

RADIOTHERAPY

*2097
Oak Ridge Inst. of Nuclear Studies
TELETHERAPY DESIGN PROBLEMS. COBALT^{60} TELETHERAPY UNIT. QUARTERLY PROGRESS REPORT [FOR] JULY 1–SEPTEMBER 30, 1953. Marshall Brucer, Herbert D. Kerman, and J. E. Richardson. 56p. Contract AT-40-1-GEN-33. (ORO-109)

The design, construction, and preliminary testing of a multicurie Co^{60} teletherapy unit for use for clinical radiotherapy are described. (C.H.)

2098
Radiological Lab., Univ. of Calif., San Francisco, School of Medicine
PHYSICS AND BIOLOGY SECTIONS. p.2-26 of ANNUAL REPORT [FOR] 1953. 26p. Contract AT-11-1-GEN-10. (UCSF-8(p.2-26))

Preliminary research activities are reported in the physical, biological, and clinical evaluation of radiations obtainable from a 70-Mev synchrotron designed for the treatment of cancer. Topics discussed include design modifications and calibration of the synchrotron; breeding and care of experimental animals; tests of relative biological efficiency of x radiation; biological calibration of the synchrotron; and the response of various mouse organs and tissues to x radiation as a function of dose rate and fractionation. (C.H.)

TRACER APPLICATIONS

2099
Harvard Univ. Medical School
POTASSIUM EXCHANGE IN THE ISOLATED RAT DIAPHRAGM; EFFECT OF ANOXIA AND COLD. Evan Calkins, Isaac M. Taylor, and A. Baird Hastings. [Jan. 1954]. 36p. Contract [AT-(30-1)-609]. (AECU-2811)

A method is described which uses K^{42} for measuring serially the K concentration of rat diaphragm and the rates of K inflow and outflow. The rat diaphragm maintained constant K concentration during incubation for a period of at least 4 hr in a medium containing K in physiological concentration. The deposition of glycogen in the diaphragm is accompanied by a net uptake of K. The rate of exchange of K between the diaphragm and the medium is 1.5%/min. The effects of anoxia and of cold on the K concentration of the tissue and on the rates of flow of K into and out of the tissue have been measured. Although the intracellular-extracellular K gradient was decreased by both procedures, anoxia leads primarily to an increase in the rate of outflow of K, whereas cold results primarily in a decrease in the rate of inflow of K. (auth)

2100
Hanford Works
STUDIES OF METABOLIC TURNOVER WITH TRITIUM AS A TRACER. 4. METABOLICALLY INERT LIPID AND PROTEIN FRACTIONS FROM THE RAT. Roy C. Thompson and John E. Ballou. Nov. 24, 1953. 13p. Contract No. W-31-109-Eng-52. (HW-30082)

Protein and lipid fractions were separated from various tissues of rats sacrificed four months and eight months after administration of tritium oxide. The concentration of bound tritium in these compound fractions was determined, and the biological half life of the tritium-labeled components of the fraction estimated from the decrease in tritium content between the two sacrifice periods. Collagen fractions exhibited half lives of 300 days or longer and lipid fractions were obtained with half lives as long as 300 days. The highest concentration of bound tritium, four months following tritium oxide adminstration, was found in brain lipids. (auth)

2101
Atomic Energy Project, Univ. of Calif., Los Angeles
THE METABOLISM OF THE ESSENTIAL FATTY ACIDS. 2. THE METABOLISM OF STEARATE, OLEATE AND LINOLEATE BY FAT-DEFICIENT AND NORMAL MICE. James F. Mead, William H. Slaton, Jr. and Arthur B. Decker. Mar. 1, 1954. 15p. Contract No. AT-04-1-GEN-12. (UCLA-283)

Normal and fat-deficient mice were given orally carboxyl-labeled methyl stearate, oleate, or linoleate. The C^{14} content of the respiratory CO_2 and various body lipids was determined. Fat-deficient mice metabolized stearate and linoleate at a significantly greater rate than did normal mice and oleate at a lower rate. The incorporation of C^{14} cholesterol seemed to bear an inverse relationship to that in total respiratory CO_2. No evidence could be found for the in vivo conversion of oleate to linoleate, but linoleate was evidently converted into arachidonate. (auth)

*2102
Radiation Lab., Univ. of Calif., Berkeley
THE PATH OF CARBON IN PHOTOSYNTHESIS. 21. THE CYCLIC REGENERATION OF CARBON DIOXIDE ACCEPTOR. J. A. Bassham, A. A. Benson, Lorel D. Kay, Anne Z. Harris, A. T. Wilson, and M. Calvin. Oct. 1953. 42p. Contract W-7405-eng-48. (UCRL-2369)

Photosynthesizing plants have been exposed to $C^{14}O_2$ for short periods of time and the products of CO_2 reduction analyzed by paper chromatography and radioautography. Methods have been developed for the degradation of ribulose and sedoheptulose. These sugars, obtained as their phosphate esters from the above $C^{14}O_2$ exposures and from other experiments, have been degraded and the distribution of radiocarbon has been determined. The distribution of radiocarbon in these sugars, and other data, indicate that sedoheptulose phosphate and ribulose diphosphates are formed during photosynthesis from triose and hexose phosphates, the latter being synthesized, in turn, by the reduction of 3-phosphoglyceric acid. Further evidence has been found for the previously proposed carboxylation of ribulose diphosphate to phosphoglyceric acid. Free energy calculations indicate this step would proceed spontaneously if enzymatically catalyzed. The efficiency of this cycle for reduction of CO_2 to hexose would be 0.9 if the reduction of each molecule of PGA requires the concurrent conversion of one molecule of ATP and one of DPN to ADP, inorganic phosphate, and DPN. This mechanism, together with an assumed mechanism for the photolysis of water, would lead to an efficiency of about 0.5 for the overall photosynthetic reaction and a requirement of about six quanta of light per molecule of CO_2 reduced to carbohydrate. (auth)

2103
Atomic Energy Project, Univ. of Rochester
A STUDY OF THE EFFECTS OF INSULIN AND OF MERCURY ON THE UTILIZATION OF MONOSACCHARIDES BY EXCISED RAT DIAPHRAGM. Dermot J. Demis. Dec. 14, 1953. 132p. Contract W-7401-eng-49. (UR-297)

The effects of insulin and of Hg on the uptake of glucose by excised rat diaphragm muscle and the role of the cell surface in this process were investigated with the aid of C^{14}-labeled glucose. On the basis of experimental data presented, a postulation is made concerning the location of the enzymes responsible for glucose uptake in the periphery of the cell, and a theory is presented concerning the mechanism of action of insulin. (C.H.)

CHEMISTRY

2104

Kansas Univ.

SOME PROBLEMS IN THE STABILIZATION OF LOW OXIDATION STATES. THE REACTION OF POTASSIUM WITH ALUMINUM(III) IODIDE IN LIQUID AMMONIA SOLUTION. Lloyd Taylor, Jacob Kleinberg, and Ernest Griswold. [1953] 31p. Contract Nonr-01600, Technical Report No. 3. (AD-21492)

Potassium, added as the solid metal or in NH_3 solution, gave an initial violent reaction with solutions of ammoniated AlI_3. An apparent end-point was reached when 1.6 ± 0.1 equivalents of K had been added, but the metal continued to react after this point. Temperature did not affect the value of the apparent end-point, but prolonged standing of the AlI_3 in NH_3 solution caused appreciable increased in the end-point values. Just before the apparent end-point, the reaction mixture became turbid. This solid product varied in composition, but always contained Al, I^-, and N. K was usually found as a minor constituent. At the apparent end-point the filtrate contained Al, I^-, and K. As more K was added, the amount of Al decreased. The ammoniated AlI_3 solution became turbid after long standing with an Al/I ratio in the filtrate of 4.3/1.0. The solid from the reaction mixture when placed in NH_3 over a long period of time reacted with the NH_3 with the appearance of Al, I^-, and K in the filtrate. NH_3 solutions of AlI_3 gave only base reactions with acid-base indicators although many aqueous solutions of Al salts are distinctly acid. Reducing experiments produced no evidence for the presence of a stable valence state of Al of less than three. KNH_2 added to solutions of ammoniated AlI_3 causes precipitates in the same manner as K. When more than 4 equivalents of amide were added, the precipitate which finally formed almost entirely dissolved and did not reappear on prolonged standing. (J.S.R.)

2105

Los Alamos Scientific Lab.

THE EXCHANGE REACTION BETWEEN SUBSTITUTED BENZYL IODIDES AND POTASSIUM IODIDE. 2. p-NITROBENZYL IODIDE. E. Lee Purlee, Milton Kahn, and J. L. Riebsomer. [1953]. 11p. Contract W-7405-eng-36. (AECU-2808)

A measurable exchange has been observed in methanol and ethanol between the I atom in p-nitrobenzyl iodide and the iodide ion in KI. The exchange reaction was investigated over a temperature range from 0 to 30.9°. The total iodide concentration in methanol and in ethanol ranged from 0.000986 to 0.00609M and 0.000983 to 0.00599M, respectively. The rate laws for the exchange reaction are $R = 3.60 \times 10^{11} \exp(-15{,}570/RT)(p\text{-}NO_2B_zI)(KI)$ in methanol and $R = 5.42 \times 10^{12} \exp(-16{,}460/RT(p\text{-}NO_2B_zI)(KI)$ in ethanol, where the units of R are moles/l/min. (auth)

2106

Laboratory for Nuclear Science, Mass. Inst. of Tech.

CHEMISTRY OF THE FISSION ELEMENTS GROUP; NUCLEAR CHEMISTRY (INORGANIC GROUP); AND NUCLEAR CHEMISTRY (ORGANIC) GROUP. p.1-23 of PROGRESS REPORT NO. 31 [FOR] SEPTEMBER 1, 1953 TO NOVEMBER 30, 1953. Nov. 30, 1953. 23p. Contract AT(30-1)-905. (AECU-2810(p.1-23))

Polarographic studies of the reduction of $Hg(CN)_2$ indicate that its formation constant, as given in the literature, is much too small. The rate of precipitation of NiS, monitored polarographically, is initially quite slow but increases autocatalytically as some precipitate is formed. Although pyro-, ortho-, trimeta-, and hexametaphosphate and glacial metaphosphoric acid give purple colors of various hues with Mn^{+3}, the pyrophosphate complex appears to be best adapted to analytical procedures. Factors affecting the deposition of Ni at a Hg cathode are being studied. The distribution coefficient of $GaCl_3$ between HCl and the ion exchange resin was determined as a function of varying acid concentrations. The fission yield curve of Bi, bombarded with 25 μamp of 15-Mev deuterons, appears as yet to be assymetrical, as no 67-hr Mo^{99} has been observed. Nuclear shell effects in fission yield fine structure in the mass region 99 to 106 were studied. Sn does not appear to extract into an ether layer from HF solutions. Although a lower limit for the Pb^{205} K-capture half life was set at $\sim 1.4 \times 10^{10}$ yr, it seems highly improbable that Pb^{205} decays by K capture. A method is described for the separation of 3.8-min Cr^{55} from Mn targets. The degradation of cyclobutylcarbinyl-C^{14}-amine provides evidence against the interconversion reactions of cyclobutylcarbinyl and cyclopentyl derivatives proceeding predominantly through a nonclassical carbonium ion intermediate. The dependence of the rate of D exchange between substituted ammonium salts and alcohols on the nature of the solvent, the structure of the ammonium salt, and the concentration of the acid present was studied. β-Lactam can be synthesized by the addition of triethylamine to a solution of phthaloylglycyl chloride and benzalaniline in refluxing methylene chloride. A ketene mechanism for the formation of β-lactam is unlikely. (J.S.R.)

2107

Michigan Univ.

CARBON-CHLORINE BOND FISSION IN THE CHLOROMETHYL GROUPS. POLAROGRAPHIC BEHAVIOR OF THE CHLOROETHANOLS. Philip J. Elving and C. Eugene Bennett. Univ. of Mich., Contract No. AT(11-1)-70, Report No. 8 and Pennsylvania State Coll., Contract No. AT(30-1)-822. Jan. 8, 1954. 17p. (COO-184)

Only 2,2,2-trichloroethanol of the three 2-chloroethanols is polarographically reducible in the potential range of 0 to −2.0 v. It gives one diffusion-controlled wave with $E_{1/2}$ of about −1.4 v vs. standard calomel electrode in the pH range of 6 to 11; $E_{1/2}$ shifts to more negative potentials at higher pH values due to acid-anion equilibrium. Coulometric measurement and the Ilkovic equation indicate that two electrons are involved in the reduction process; accordingly, trichloroethanol is probably reduced to dichloroethanol. Trichloroethanol can be determined polarographically with an accuracy of ±2%. Tabulation of $E_{1/2}$ values for carbon-chlorine fission in Cl_3C-R, Cl_2CH-H and $ClCH_2$-R type molecules involving removal of one halogen indicates that $E_{1/2}$ becomes more positive (reduction easier) as a greater electron-withdrawing group is substituted for R. (auth)

2108

Michigan Univ.

POLAROGRAPHIC AND COULOMETRIC BEHAVIOR OF THE CHLOROACETALDEHYDES. Philip J. Elving and C. Eugene Bennett. Univ. of Mich., Contract No. AT(11-1)-70, Report No. 9 and Pennsylvania State Univ., Contract No. AT(30-1)-822. Jan. 27, 1954. 27p. (COO-185)

Chloral hydrate gives one pseudo-diffusion-controlled wave of $E_{1/2}$ about −1.4 v vs. standard calomel electrode, dichloroacetaldehyde two kinetic-controlled waves at −1.0 and −1.7 v, and chloroacetaldehyde two kinetic-controlled waves at −1.1 and −1.7 v. Coulometric and polarographic data show that chloral hydrate is reduced to dichloroacetaldehyde hydrate; the latter dehydrates and the unhydrated molecule is reduced to chloroacetaldehyde which is then reduced to acetaldehyde; finally, the latter is reduced to either or both ethyl alcohol and 2,3-dihydroxy-

butane. This over-all reduction process forms only one wave; the acetaldehyde, whose reduction should result in a second wave, is formed in such a small amount that the wave is only clearly demarcated in ammonia buffers. Dichloroacetaldehyde is reduced to chloroacetaldehyde, which in turn is reduced to acetaldehyde with the formation of one wave; acetaldehyde reduction accounts for the second wave. Chloroacetaldehyde's first wave is due to reduction to acetaldehyde; the second is due to reduction of acetaldehyde. (auth)

2109

Naval Research Lab.

THERMAL AND RELATED PHYSICAL PROPERTIES OF MOLTEN MATERIALS. PROGRESS REPORT NO. 8 [FOR] PERIOD NOVEMBER 1, 1953 TO JANUARY 31, 1954. D. D. Williams, C. T. Ewing, and B. E. Walker. Feb. 5, 1954. 7p. (NRL-Memo-258)

Work has continued on the reaction of NaOH with container materials in that comparisons have been made between the reactions of NaOH with Fe and Cr and those originally reported for Ni. Final results on the thermal conductivity and heat content on $MoSi_2$ are presented in this report. Preliminary results on the heat content and heat capacity of salt A are also included. (For preceding period see NRL-Memo-230.) (auth)

*2110

Oak Ridge National Lab.

PREPARATION OF HIGH-PURITY, ANHYDROUS LITHIUM IODIDE. Ray H. Sampley. Mar. 3, 1954. 12p. Contract No. W-7405-eng-26. (ORNL-1673)

Preparations are described for high-purity anhydrous LI and the necessary starting materials. The LI prepared as described has been satisfactory for the preparation of single crystals of LI for evaluation as neutron-absorbing phosphors in scintillation counters. (auth)

*2111

Radiation Lab., Univ. of Calif., Berkeley

A THERMODYNAMIC STUDY OF GASEOUS OXIDES (thesis). Richard Francis Porter. Dec. 1953. 46p. Contract W-7405-eng-48. (UCRL-2416)

A study was made of the gaseous state of MgO. Vapor-pressure measurements on the solid oxide show that the solid vaporizes mainly into molecular species. Spectroscopic experiments have been conducted and have shown that the known gaseous $^1\Sigma$ electronic state of MgO is not the principal vaporizing specie. A study of the ultraviolet bands, produced by Mg burning in air, prove the ground electronic level of the molecule involved in this transition is more important than the $^1\Sigma$ state of MgO. Within experimental uncertainty the heat of sublimation obtained from vapor-pressure measurements agrees with a spectroscopically determined heat of sublimation of the unknown specie involved in the ultraviolet transition. The dissociation energy of SnO has been determined by combining the heat of formation of SnO and a redetermined value of the heat of sublimation of Sn. The dissociation energy obtained thermochemically agrees with a linear Birge-Sponer extrapolation to the ground-state atoms. (auth)

2112

Radiation Lab., Univ. of Calif., Berkeley

IDENTIFICATION OF THE "ULTRAVIOLET SPECIE" IN MAGNESIUM OXIDE VAPOR. Leo Brewer and Richard F. Porter. Jan. 12, 1954. 7p. Contract No. W-7405-eng-48. (UCRL-2454)

The ultraviolet band system produced in emission from MgO vapor in thermal equilibrium with the solid oxide is shown to originate from a gaseous monomer of MgO. (auth)

2113

THE REACTION OF NICKEL ION WITH DIMETHYLGLYOXIME IN THE PRESENCE OF OXIDIZING AGENTS. A. K. Babko. Translated from Zhur. Anal. Khim. 3, 284-9(1948). 11p. (AEC-tr-1443; AEC-tr-1416; W. O. 27829)

An investigation has been made of the reaction of Ni with dimethylglyoxime in the presence of oxidants. It was shown that molar extinction coefficients are a good criterion for comparing the sensitivity of reactions; it was shown by this means that the sensitivity of dimethylglyoxime as a reagent for detecting Ni is increased threefold in the presence of oxidants. The composition of the complex was studied by physicochemical methods of solution analysis. It was found that when the excess of oxidant is slight, the composition of the complex is $Ni:H_2Dm = 1:2$. When the excess of oxidant is large, the ratio is 1:3. The structure of the complex is discussed. It is shown that contrary to Feigl's views, the complex is a combination of Ni^{++} with some unstable oxidation product of dimethylglyoxime. (auth)

2114

THE ACTION OF CERTAIN DIHALOID HYDROCARBON DERIVATIVES ON ETHYL ESTER OF PHOSPHOROUS ACID AND ON SALTS OF DIETHYL PHOSPHOROUS ACID. A. E. Arbuzov and N. P. Kushkova. Translated by E. R. Hope, from Zhur. Obshchei Khim. 6, 283-8(1936). 11p. (AEC-tr-1763)

Experiments are described on the reactions between CH_2I_2 and the ethyl ester of phosphorous acid, saponification of the ester of I-substituted methylphosphonic acid and the ester of hydroxymethylphosphonic acid, the production of a K derivative of diethylphosphorous acid and reaction of the derivative with CH_2I_2, action of Na diethylphosphite on CH_2I_2, and action of trimethyl bromide on Na diethylphosphite. (J.E.D.)

2115

COMPLEX IONS. XII. THE HOMOLOGS OF ETHYLENEDIAMINE-TETRA ACETIC ACID AND THEIR ALKALINE EARTH COMPLEXES. G. Schwarzenbach and H. Ackermann. Translated from Helv. Chim. Acta 31, 1029-48(1948). 33p. (AEC-tr-1794)

2116

OXIDATION OF PHOSPHINE WITH WATER UNDER PRESSURE. I. N. Bushmakin and A. V. Frost. Translated from Zhur. Priklad. Khim. 6, 607-12(1933). 10p. (AEC-tr-1795)

2117

PROPERTIES OF Al_2TiO_5. V. A. Bron and A. K. Podnogin. Translated by R. R. Kepple from Doklady Akad. Nauk S.S.S.R. 91, 93-4(1953). 9p. (AEC-tr-1814)

The following properties of Al_2TiO_5 were determined: crystal structure, melting point, specific gravity, harndess, solubility in acids and bases, and coefficient of thermal expansion. (J.E.D.)

AEROSOLS

2118

Chemical and Radiological Labs., Army Chemical Center

AEROSOLS. REPORT OF SYMPOSIUM V CONDUCTED JUNE 22 AND 23, 1953 AT ARMY CHEMICAL CENTER, MARYLAND. 150p. (NP-5065)

Topics discussed at this conference included the production of condensation nuclei; factors which affect the visibility of colored smokes; isokinetic flow conditions affecting the quantitative sampling of an aerosol from a moving air stream; the use of wind tunnel models in studies of stack problems associated with the adequate dispersal of gases and particulate matter into the atmosphere; a method for determining the toxicity of a particular atmosphere, as distinct from the toxicity of the components which are present, by determination of the length of time experimental animals will survive continuous exposure to such an atmosphere; the physical and biological behavior of

aerosols in closed chambers; the influence of electrification and foreign vapors on the aggregation process associated with aging of aerosols; and a method for measuring the particle size distribution of aerosols by photographing the individual droplets in a flowing, thin stream subjected to intermittent flashes of a very high intensity illumination under optical conditions associated with dark field microscopy. (C.H.)

ANALYTICAL PROCEDURES

2119

Knolls Atomic Power Lab.

A METHOD FOR SPARKING THIN SHEET SAMPLES FOR SPECTROGRAPHIC ANALYSIS: APPLICATION TO Mn AND Nb ANALYSES. F. P. Landis and L. P. Pepkowitz. Jan. 21, 1954. 3p. Contract W-31-109-Eng-52. (AECU-2816)

A technique was developed for sparking thin sheets of steel for the spectrographic determination of Mn and Nb. The sample is cooled during sparking by ice-cooled He flowing over the unsparked surface of the sheet. A He flow of 5 to 25 l/min, depending upon the thickness of the sample, produced the best results. The percentages of Mn and Nb were read from working curves that had been prepared using the standard massive samples. The precision is very good, but a correction factor must be applied as the results are high. (J.S.R.)

*2120

Argonne National Lab.

THIOCYANATE SPECTROPHOTOMETRIC DETERMINATION OF MOLYBDENUM AND TUNGSTEN. C. E. Crouthamel and C. E. Johnson. Feb. 1954. 27p. Contract No. W-31-109-eng-38. (ANL-5224)

Previous difficulties in the development of the maximum and stable Mo(V) thiocyanate and W(V) thiocyanate absorbencies have been critically examined and corrected. The molar absorbency index in the acetone thiocyanate medium employed is 18,700 ± 150 at 460 mμ for Mo(V) and 17,600 ± 130 at 398 mμ for W(V). The absorbencies in the acetone medium of the other stable valence states of W and Mo have been reported. (auth)

2121

Atomic Energy Project, Univ. of Calif., Los Angeles

AN IMPROVED METHOD FOR THE ISOLATION OF SODIUM DESOXYRIBONUCLEATE FROM E. COLI. Amos Norman and Norman S. Simmons. Feb. 19, 1954. 19p. Contract AT-04-1-GEN-12. (UCLA-280)

Sodium dodecyl sulfate is used at pH 7.0 for lysing the bacteria, extracting the desoxyribonucleic acid (DNA), and for deproteinization. In this way highly polymerized DNA in good yield and free from gross contaminants is obtained relatively quickly and conveniently. (auth)

2122

Radiation Lab., Univ. of Calif., Berkeley

THE EFFECT OF Δ^7-CHOLESTENOL FEEDING ON THE CHOLESTEROL AND LIPOPROTEINS OF RABBIT SERUM. Richard M. Lemmon, Frank T. Pierce, Jr., Max W. Biggs, Margaret A. Parsons, and David Kritchevsky. Nov. 17, 1953. 16p. Contract No. W-7405-eng-48. (UCRL-2397)

The cholesterol isomer, Δ^7-cholestenol, has been fed to rabbits as part of a program to compare the effects of this sterol with that of cholesterol on the pathogenesis of atherosclerosis. The results of this research have shown that the serum lipoprotein pattern developed after the ingestion of Δ^7-cholestenol is very similar to that observed after cholesterol feeding. It has also been observed that the Δ^7-cholestenol feeding results in a rapid rise in the serum cholesterol level, a rise which is comparable to that which is observed after feeding cholesterol itself. A method for the quantitative determination of Δ^7-cholestenol is presented. (auth)

2123

Radiation Lab., Univ. of Calif., Berkeley

ULTRACENTRIFUGAL ANALYSIS OF SERUM LIPOPROTEINS. Oliver de Lalla and John W. Gofman. Dec. 1953. 32p. Contract No. W-7405-eng-48. (UCRL-2427)

An ultracentrifugal method is described for use in the analysis of serum lipoproteins. The method takes advantage of the variation in density of the lipoproteins to effect a preliminary ultracentrifugal separation of a series of lipoproteins within the density range of interest. The final separation is achieved in an analytical centrifuge equipped with a diagonal wire-cylindrical lens schlieren optical system and camera. The refractive index gradients of the lipoproteins are determined by comparison of the ultracentrifugal film record with tracings from a reference run. An equation is used for converting ultracentrifugal data to concentration in mg percent. Details of the procedure, and illustrative data are included. (C.H.)

2124

QUANTITATIVE DETERMINATION OF THE STOICHIOMETRICALLY BOUND WATER-CONTENT IN HYDROGELS AND OTHER FINELY DISPERSED SYSTEMS, USING THE 'THIRD COMPONENT' METHOD. P. T. Danil'chenko. Translated by E. Hope from Zhur. Anal. Khim. 2, 299-308(1947). 11p. (AEC-tr-114)

2125

GLUCONIC ACID WITH SPECIAL REFERENCE TO ITS IDENTIFICATION AND ESTIMATION. W. Diemair, B. Bleyer, and L. Schneider. Translated by Margaret V. Colven from Z. Untersuch. Lebensm. 69, 212-20(1935). 14p. (AEC-tr-1789)

d-Gluconic acid can be detected as gluconic acid phenyl hydrazide in pure solutions. C cannot be used as an adsorbent of colored impurities as it also adsorbs d-gluconic acid phenylhydrazide. The presence of glycerine, sorbital, tannic materials, malic acid, and citric acid do not interfere with the determination, but d-glucose must be removed. The gluconic acid cannot be detected in pure pressed apple juice and apple cider by the phenyl hydrazine method. (J.S.R.)

2126

A NEW METHOD FOR SIMULTANEOUS MICRODETERMINATION OF THE CARBON, OXYGEN, HALOGEN OR SULFUR CONTENT IN ORGANIC COMPOUNDS. M. O. Korshun and [N. S. Sheveleva]. Translated from Doklady Akad. Nauk S.S.S.R. 60, 63-5(1948). 9p. Available from Research Information Service, 509 Fifth Ave., New York 17, N. Y. (AEC-tr-1797)

Experimental results indicate that the technique of burning a substance to be analyzed in a rapidly moving stream of O_2, with the separation of secondary products, can be applied to the analysis of compounds of C, H, O, and halogens and C, H, O, and S. (J.E.D.)

2127

CONCERNING APPLICATIONS OF BASE-EXCHANGING SUBSTANCES IN ANALYTICAL CHEMISTRY. PART 4. DETERMINATION OF IRON AND ALUMINUM IN PRESENCE OF PHOSPHORIC ACID. Olof Samuelson. Translated from Svensk Kem. Tidskr. 52, 241-6(1940). 10p. Available from Technical Library Consultants, 347 Madison Ave., New York 17, N. Y. (AEC-tr-1803)

2128

EXAMINATION OF GASES IN METALS. W. Hessenbruch. Translated by Erich W. Stenzel from Z. Metallkunde 21, 46-55(1929). 29p. (AEC-tr-1807)

Various kinds of fixation in which the gas may occur in the solid metal are discussed, and methods for determining

this gas, suitable for various purposes, are mentioned. The individual processes are discussed briefly, and their nature and reliability, as well as their application to the individual metals, are mentioned. Several results of gas analyses are given in connection with Cu, Ni, Al, Zn, and Fe according to the vacuum-melting process. (auth)

2129
A "COMPLETE" CALCULATING BOARD FOR SPECTROCHEMICAL ANALYSIS. H. Kaiser. Translated by K. J. Marsh from Spectrochim. Acta 4, 351-65(1951). 19p. Available from the British Non-Ferrous Metals Research Association (Trans. No. MP439), Euston St., London. (AEC-tr-1809)

A calculating board is described which makes it possible to derive analyses from the observations of a spectrum. By a cylindrical diagram the usual Seidel transformation can be carried out as a preliminary to drawing the calibration line. For the correction of background, or of interfering line effects, Gaussian subtraction logarithms are incorporated into a special slide. The mathematics of various methods of evaluating spectra are outlined in such a way as to show that each method can make use of this calculating board, and its use is illustrated by a few examples in diagrammatic form. (auth)

2130
FILTER PAPER CHROMATOGRAPHY APPLIED TO INORGANIC ANALYSIS. (La Cromatografía Sobre Papel De Filtro En El Analisis Inorganico). Agustin Vioque Pizarro. Translated from Inform. quim. anal. (Madrid) 4, 127-39(1950). 27p. (AEC-tr-1815)

A brief history of the development of the technique of filter paper chromatography is presented, various applications of the technique in inorganic analysis are discussed, and lines of future development for the technique are suggested. 40 references. (C.H.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

2131
Laboratory for Insulation Research, Mass. Inst. of Tech.
AN X-RAY DIFFRACTION STUDY OF BARIUM TITANATE. H. T. Evans, Jr., Laboratory for Insulation Research Mass. Inst. of Tech. and Philips Labs., Inc. Jan. 1953. 36p. Contracts N5ori-07801 and N5ori-07858; Technical Report 58. (NP-5067)

DEUTERIUM AND DEUTERIUM COMPOUNDS

2132
Atomic Energy Research Establishment, Harwell, Berks (England)
THE DETERMINATION OF THE D_2O CONTENT OF HEAVY WATER BY A MASS SPECTROMETER. P. Reynolds and B. A. Loveridge. Oct. 26, 1953. 29p. (AERE-GP/R-1282)

The determination of the D_2O content of samples of heavy water containing approximately 99.7% D_2O is described. Deuterium in equilibrium with the water is analyzed for its H_2 content by means of a mass spectrometer. This instrument, which is fully described, is of simple construction, easy to operate, and suitable for the routine analysis of samples. The over-all precision of measurement is ±0.01% D_2O. Results are compared with those obtained for the same samples using an infrared absorption method. (auth)

2133
VAPOR PRESSURE AND HEAT OF VAPORIZATION OF HEAVY WATER. E. H. Riesenfeld and T. L. Chang. Translated by A. E. Cameron from Z. Physik. Chem. 33B, 120-6(1936). 3p. (AEC-tr-1804)

The vapor pressures of D_2O and H_2O were compared with each other from 20 to 230°. The vapor pressure difference $P_{H_2O} - P_{D_2O}$ increased at first with increasing temperature, reached a maximum of 82.6 mm at 170°, then decreased, went through the zero point at 225°, and became negative. Tables of the vapor pressure and the heat of vaporization of D_2O were prepared. (auth)

FLUORINE AND FLUORINE COMPOUNDS

2134
MEASUREMENT OF THE DISSOCIATION POTENTIAL OF FUSED POTASSIUM FLUORIDE AND SODIUM FLUORIDE. V. S. Molchanov. Translated from Legkie Metal 4, 28-31 (1935). 9p. (AEC-tr-1442; W.O. 27634)

The decomposition potentials of NaF and KF were studied by means of an apparatus of original design. The figures obtained were considerably higher than those given by other authors but are probably closer to the true values. The papers written by these authors show that their decomposition potentials were obtained under conditions which did not exclude depolarization processes (unsatisfactory separation of electrode chambers, insufficient time for conditioning, etc.). The deviation of data from theoretical values is tentatively explained by depolarization of the anode process because of fluoridization of the graphite and depolarization caused by diffusion of the metallic cloud and the formation of oxide. (auth)

2135
ASSOCIATION OF HYDROGEN FLUORIDE. G. V. Tsitsishvili. Translated from Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk, No. 2, 162-8(1950). 9p. Available from Associated Technical Services (Trans. RJ-33), East Orange, New Jersey. (AEC-tr-1798)

The intermolecular reaction of HF has been investigated. It was shown that polarity has a pronounced effect on repulsion between molecules. This effect is particularly noticeable (in the direction of diminishing the repulsion) during the reaction of chemically saturated atoms of H with one another, as well as with other chemically saturated atoms. The association of liquid HF and of other H halides is characterized. (auth)

2136
SEPARATION AND DETERMINATION OF FLUORINE. E. Rinck. Translated by C. A. Horton from Bull. soc. chim. France 305-24(Mar. 1948). 36p. (AEC-tr-1806)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 2-61.

2137
A NOTE ON THE FLUORINE RESONANCE SHIFTS. A. Saika and C. P. Slichter (Univ. of Illinois, Urbana). J. Chem. Phys. 22, 26-8(1954) Jan.

A theoretical analysis is given of the F_2 magnetic resonance shifts in molecules. It is shown that the large range of shifts among different F_2 compounds arises from the effects of binding on the magnetic fields at the nucleus produced by the orbital motion of the electrons in the unfilled valence shell. The simple dependence on ionic character of the bond is also explained. The chemical shift between F_2 and HF is calculated to be 14×10^{-4}, compared to the experimentally observed value 6.3×10^{-4}. (auth)

2138
RAMAN SPECTRA OF CHLOROFLUOROMETHANES IN THE GASEOUS STATE. Howard H. Claassen (Univ. of Oklahoma, Norman). J. Chem. Phys. 22, 50-2(1954) Jan.

Raman spectra of gaseous CCl_4, CCl_3F, CCl_2F_2, $CClF_3$, and CF_4 are presented in the form of microphotometer traces. All but one of the fundamental frequencies of these molecules have been observed. (auth)

GRAPHITE

2139
MASS SPECTROMETRIC STUDY OF THE MOLECULAR SUBLIMATION OF GRAPHITE. Richard E. Honig (Radio

Corp. of America, Princeton, N. J.). J. Chem. Phys. 22, 126-31(1954) Jan.

The emission of neutral and charged C molecules from spectroscopically pure graphite has been studied by rate-of-vaporization experiments in a 180° mass spectrometer. Small filaments 0.015 in. in diam., heated by a-c up to 2600°K, yielded neutral particles which were converted into positive ions by bombardment with low-energy electrons. C_3^+, C_2^+, and C_1^+ ions were found. Although the effects of fragmentation and of differences in ionization cross sections may not be negligible, it is believed that C vapor consists largely of C_3 molecules. Graphite was found to emit negative ions containing from 1 to 8 C atoms. C_2^-, C_4^-, and C_3^- were the most abundant species, in that order. A search was made for C particles emitted as positive ions, but none were found. Heats of activation were obtained for the neutrals and the more abundant negative ions from the slopes of log p vs. 1/T plots. Identical heats measured for C_1 and C_3 (178 ± 10 kcal/mole at 2500°K) suggest that these two species may sublime at rates that are interdependent. Thus, this value may not be representative of the true heat of sublimation of C_1. For C_2, a heat of 199 ± 20 kcal/mole was measured at 2400°K. Electron affinities have been computed for C_1, C_2, and C_3, and estimated bond energies deduced for C_2 and C_3. Some of the earlier measurements of the heat of sublimation of graphite, obtained from rates of vaporization and equilibrium effusion, but without mass analysis, have been reinterpreted, taking into account the complex character of the sublimation processes. (auth)

LABORATORIES AND EQUIPMENT

*2140

Knolls Atomic Power Lab.

A PERFORMANCE STUDY OF LABORATORY FUME HOODS. C. G. Detwiler. Jan. 1954. 21p. Contract No. W-31-109 Eng-52. (KAPL-864)

The design of a smoke generator and the technique applied in its use for investigating fume-hood performance characteristics are described. Observations from investigating the performance characteristics of the several types of hood installations used at KAPL are presented. The observations disclose that hood efficiency is a function of the amount that the hood door has been opened, the face velocity, and the degree of physical activity in the immediate proximity of the hood opening. The observations suggest adherence to the following hood operating conditions: a door opening of no more than 50%, a face velocity of 125 to 150 fpm, and no more than moderate activity immediately in front of the hood door. (auth)

RADIATION CHEMISTRY

2141

IRRADIATION OF FERROUS AMMONIUM SULFATE SOLUTIONS: ENERGY ABSORPTION AND IONIZATION CALCULATIONS FOR COBALT 60 AND BETATRON RADIATION. D. V. Cormack, R. W. Hummel, H. E. Johns, and J. W. T. Spinks (Univ. of Saskatchewan, Saskatoon, Canada). J. Chem. Phys. 22, 6-12(1954) Jan.

Solutions of $Fe(NH_4)_2(SO_4)_2$ in 0.8N H_2SO_4 have been irradiated with Co^{60} γ rays and with x rays from a 25-Mev betatron. The energy absorbed per unit volume of solution has been calculated from a modification of the Bragg-Gray formula $E_\nu = J_\nu W_\rho$, in which the factor ρ was determined according to a calculated distribution of primary electron energies. The chemical yield was then calculated in terms of G, the number of ferrous ions oxidized per 100 ev absorbed. (auth)

2142

ON THE SCAVENGER EFFECT IN THE n,γ REACTION IN CARBON TETRACHLORIDE. William H. Hamill and Russel R. Williams, Jr. (Univ. of Notre Dame, Ind.) and (Brookhaven National Lab., Upton, New York). J. Chem. Phys. 22, 53-6(1954) Jan.

Neutron bombardment of liquid CCl_4 yields 38.5-min. Cl^{38}, and approximately 40% of the induced activity is retained in organic form. Dissolved Cl reduces this retention in a regular fashion to approximately 25% at a concentration of 6 mole %. Allyl chloride increases retention to 53% in equivalent concentrations. Neither of these scavenger effects is significantly dependent on the intensity of total dose of concomitant nonactivating pile radiation. This rules out the radiation decomposition theory of scavenger action and supports an atom-radical diffusion-recombination mechanism. (auth)

2143

ROTATING SECTOR METHOD APPLIED TO REACTIONS INDUCED BY Co^{60} GAMMA RAYS. R. W. Hummel, G. R. Freeman, A. B. Van Cleave, and J. W. T. Spinks (Univ. of Saskatchewan, Saskatoon, Canada). Science 119, 159-60 (1954) Jan. 29.

A rotating sector is described and illustrated photographically, which was designed to be placed between a 100-c Co^{60} γ source and the samples of chemicals to be irradiated, thus allowing the samples to remain stationary during intermittent irradiation. The sector is a solid steel cylinder, 6 in. in diameter, 1 ft long with two 60° sectors cut out on opposite sides, and connected through a series of pulleys to a variable speed motor. The apparatus was used to investigate the effects of radiation on 1M aqueous chloroform saturated with water, and preliminary data are reported. (C.H.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

2144

Ames Lab.

FLUORESCENCE SPECTROMETRIC DETERMINATION OF TERBIUM. Velmer A. Fassel and Robert H. Heidel. Jan. 29, 1954. 18p. Contract W-7405-eng-82. (ISC-313)

Spectrophotometric measurements on the sharp absorption bands exhibited by aqueous solutions of many of the rare earths have provided the most useful analytical methods for the determination of individual rare earths in their mixtures. Because Tb does not possess any absorption bands suitable for analytical purposes, quantitative methods for its determination have not been available. It has been found that Tb can be determined as a major constituent in complex rare earth mixtures by measurements of the fluorescent spectrum emitted when aqueous solutions containing Tb are irradiated with ultraviolet light. Possible interferences from other rare earths as well as non-rare earth ions were evaluated, and simple means for eliminating the interferences were developed. The coefficient of variation for the Tb determination at various concentrations varied from 1.8 to 2.5%. This method provides a direct and rapid analytical method for the determination of Tb in rare earth mixtures and Tb concentrates. (auth)

2145

Ames Lab.

THE STRUCTURE OF Gd, Dy, AND Er at LOW TEMPERATURES. J. R. Banister, S. Legvold, and F. H. Spedding. [Feb. 10, 1954]. 12p. Contract W-7405-eng-82. (ISC-457)

The crystal structures of Gd, Dy, and Er have been determined over a wide temperature range. The metals are hexagonal close packed, and the a_0 unit axis contracts nearly linearly with decreasing temperature, whereas the c_0 unit axis exhibits an abnormal expansion with decreasing temperature below magnetic transformations of the metals. The c_0 behavior is believed to be associated with the magnetic properties of the metals. (auth)

2146
Mound Lab.
PREPARATION OF CARRIER-FREE LANTHANUM-140. M. L. Salutsky and H. W. Kirby. July 31, 1953. 12p. Contract AT-33-1-GEN-53. (MLM-889)

Tracer methods for La find limited usage because of the short half life (40 hr) of the radioisotope La^{140}. A continual supply of carrier-free La^{140} can be obtained by milking it at intervals of a few days from its parent, Ba^{140} (12.8-day half life). Ba^{140} is precipitated with $Ba(NO_3)_2$ carrier from 80% HNO_3, and La^{140} is recovered from the filtrate. A yield of about 90% was obtained, and high purity was indicated by the fact that the La^{140} decayed with a 40-hr half life for about 15 days. By use of this method, a tracer supply of La^{140} is available for several weeks from an initial source of a few mc of Ba^{140}. A modified filter beaker, specially adapted for radiochemical work, is described. (auth)

SEPARATION PROCEDURES

2147
Ames Lab.
DISTRIBUTION OF THORIUM NITRATE BETWEEN WATER AND A MIXTURE OF BUTYL PHOSPHATE AND BUTYL ETHER. Marion R. Anderson. July 1, 1950. Decl. Nov. 25, 1953. 23p. Contract W-7405-eng-82. (ISC-116)

Data were obtained for the distribution of $Th(NO_3)_4$ between water and a mixture of butyl phosphate and butyl ether, for conditions simulating those to be found in each of the two liquid-liquid extraction columns erected for the separation of $Th(NO_3)_4$ from rare earths. Distribution expressions were calculated and plotted, and equilibrium curves were plotted. Mention is also made of a number of methods of analysis which were attempted and proved unsatisfactory. (auth)

*2148
Knolls Atomic Power Lab.
A MINIATURE MIXER SETTLER FOR CONTINUOUS COUNTERCURRENT SOLVENT EXTRACTION. H. Ward Alter, James W. Codding, and Alfred S. Jennings. Nov. 25, 1953. 39p. Contract W-31-109-Eng-52. (KAPL-961)

A unit for continuous multistage countercurrent solvent extraction, the miniature mixer settler, is described. The over-all size of a 16-stage unit is 3 in. × 14 in. × 8 in. The total holdup per stage is about 8 cc, and flow rates to the unit may be in the range 0.05 to 4 cc/min. The device requires little operator attention, and stage samples may be conveniently withdrawn. Bank efficiencies have been measured as a function of total flow rate to the bank using as test systems either aniline or phenol as solute distributing between 0.8M $NaClO_4$ and iso-octane. For the 12-stage bank tested, 11.4 theoretical stages were found at a total flow rate to the bank of 0.97 cc/min. The efficiency fell off to 71% at 3.4 cc/min, and flooding occurred at 4.6 cc/min for the system tested. Efficiency is shown to have been limited by settling rather than mixing efficiency. (auth)

*2149
Atomic Energy Project, Univ. of Calif., Los Angles
A NEW APPROACH TO THE SEPARATION OF FATTY ACIDS DIFFERING IN DEGREE OF UNSATURATION. David R. Howton. Feb. 19, 1954. 30p. Contract AT-04-1-GEN-12. (UCLA-279)

A technique is described by which the classes of saturated, mono-unsaturated, and di-unsaturated fatty acids from a sample of naturally occurring lipid of the order of 0.5 g may be simply and cleanly separated. The fatty acid mixture obtained by saponification of the lipid is brominated, converted to the corresponding methyl ester mixture, chromatographed on an alumina column, and eluted with pentane and mixtures of regularly increased ethyl ether content. (auth)

2150
CONTINUOUS COUNTER CURRENT EXTRACTION OF A DISSOLVED SUBSTANCE FROM THE WATER PHASE BY AN ORGANIC SOLVENT. V. N. Kozlov and B. I. Smolenskii [Smolenskiy]. Translated from Zhur. Priklad. Khim. 23, 1290-8(1950). 23p. (AEC-tr-1796)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 5-5610.

2151
COUNTERCURRENT CONTACTORS. Peter L. Auer and Clifford S. Gardner (Calif. Research and Development Co., Livermore). Ind. Eng. Chem. 46, 39-42(1954) Jan.

A number of chemical processes utilize countercurrent solvent extraction units for the separation of mixtures into their individual components. Rigorous analysis of transient behavior in continuous contactors is often very difficult or impossible. It is therefore useful to infer the behavior of continuous systems from simulated batch-type systems, which are amenable to rigorous analysis. A countercurrent batchwise extraction process may be conveniently described by means of a cascade diagram on the basis of which a set of difference equations are evolved relating the composition of a given contacting unit to the variables of the system. A general method for solving these difference equations is given and applied to an end-fed column and symmetric and nonsymmetric center-fed columns. The method of analysis presented provides a complete description of the batchwise contacting system in terms of its physical parameters and allows the fractional approach to steady state to be determined. In principle, this method of analysis may be extended to any unit operation which effects separation in a mixture on account of differences in the distribution of components between two phases. (auth)

2152
FLOW OF LIQUIDS THROUGH PERFORATED-PLATE LIQUID EXTRACTION TOWERS. Robert J. Bussolari, (E. I. du Pont de Nemours and Co., Wilmington, Del.), Seymour Schiff (National Lead Co., New York) and Robert E. Treybal (New York Univ.). Ind. Eng. Chem. 45, 2413-17(1953) Nov.

Date leading to a design procedure for calculating some of the conditions that limit flow rates through perforated-plate liquid-extraction towers are presented. (J.A.G.)

2153
THE THEORY OF RADIOACTIVE ION EXCHANGE. E. Pitts (Kodak Ltd., Harrow, Middlesex, England). J. Chem. Phys. 22, 56-65(1954) Jan.

Experiments reported by other workers have shown that when a precipitate of AgBr is shaken with a solution containing either Ag or bromide ions, some of which are radioactive, the radioactive strength of the solution decreases. The final value reached corresponds to a uniform distribution of the active material throughout both solid and solution. No agreement on the interpretation of these results has up until now been reached. Two possible mechanisms for this exchange are described, and their consequences are examined. A new theoretical treatment is given which includes a consideration of the effect of the spread in crystal sizes, which was neglected in previous discussions of the problem. From those results, a new method of comparison between theory and experiment is suggested. This shows unambiguously that the exchange of Ag ions is in agreement with predictions based on the hypothesis that the ions diffuse through the solid. It is shown that the exchange of bromide ions cannot be explained in this way. Values obtained for the diffusion constant of Ag are in fair agreement with those from other sources. The relation of these results to the various suggestions put forward by other workers is discussed. (auth)

2154

ION-EXCHANGE AND ADSORPTION COLUMN KINETICS WITH UNIFORM PARTIAL PRESATURATION. Theodore Vermeulen and Nevin H. Hiester (Univ. of California, Berkeley). J. Chem. Phys. 22, 96-101(1954) Jan.

The available mathematical solutions for fixed-bed concentration histories apply primarily to one-component systems in adsorption and to two-component systems in ion exchange. Thomas (J. Am. Chem. Soc. 66, 1664(1944)) has developed explicit general relations for the saturation of an adsorbent bed initially free of saturating component by a fluid phase containing only this component, as well as for the converse elution situation. These results are extended to cases of mixed binary feeds (in ion exchange) and cases of columns that are uniformly partially saturated prior to the run under study. New definitions of the dimensionless parameters that characterize the sorption processes render the existing numerical framework applicable for evaluating this broadened range of operating conditions. From the theoretical standpoint, these new parameters clarify the mathematical interrelationships between adsorption and ion exchange, between saturation and elution, and between sorption of trace components and sorption of gross or bulk components. A method is suggested for calculating physical-adsorption operations which do not conform to Langmuir isotherms. Calculation procedures based upon this approach are illustrated by an idealized but representative example. (auth)

SPECTROSCOPY

2155

Tennessee Univ.

THE INFRARED SPECTRUM OF σ_2 FOR $B^{10}F_3$ AND $B^{11}F_3$. Alvin H. Nielsen. Dec. 10, 1953. 16p. Contract DA-33-008-ORD-394, Technical Report No. 2, and [Contract W-7405-eng-26]. (AECU-2815)

The infrared grating spectra of σ_2 for $B^{10}F_3$ and $B^{11}F_3$ have been reexamined from 650 to 750 k. Two samples of BF_3, one composed of 93.4% $B^{10}F_3$ and 6.6% of $B^{11}F_3$ and the other of the normal abundance ratio 20% $B^{10}F_3$ and 80% $B^{11}F_3$, were secured for the investigation. Complete resolution of the rotational fine structure of this parallel-type band was achieved. The following constants were obtained by means of the usual sort of rotational analysis: For $B^{10}F_3$, $\sigma_0 = 718.23$ K, $B_0 = 0.3527_2$ k, $B(v_2 = 1) = 0.3528_8$ k, $D_J = 13.72 \times 10^{-7}$ k. For $B^{11}F_3$, $\sigma_0 = 691.45$ k, and the rotational constants are the same for the 2 isotopic species. (auth)

2156

SIMPLE METHOD OF MAKING A STEP WEDGE FOR SPECTRUM ANALYSIS IN ULTRAVIOLET. N. Sventitski. Translated from Zavodskaya Lab. 8, 512-14(1939). 8p. Available from Henry Brutcher (Trans. No. 1434), Altadena, Calif. (AEC-tr-1802)

Step wedges suitable for quantitative analysis in the ultraviolet range can be prepared by applying a coat of soot to a quartz plate. The soot coating is applied by moving the clean, heated quartz plate through a steady gasoline or kerosene flame at an experimentally determined rate. The steps are traced with a small pointed stick and separated by means of glass filaments. Tinfoil pieces are used to limit the length of the step wedge and a quartz protective plate is fastened over the step wedge. (J.S.R.)

2157

X-RAY ABSORPTION SPECTRA OF ZINC IN MOLECULES OF $ZnCl_2$, $ZnBr_2$, AND ZnS. K. I. Narbutt. Translated from Doklady Akad. Nauk S.S.S.R. 92, 273-5(1953). 3p. (NSF-tr-187)

The x-ray-absorption spectra of the free molecules which contain a Zn atom are reported. The experiment consisted essentially of photographing the x-ray-absorption spectra of the substance in a gaseous state. (J.E.D.)

2158

THE INFRARED SPECTRUM AND MOLECULAR CONSTANTS OF $C^{14}O_2$. Alvin H. Nielsen and Robert T. Lagemann (Univ. of Tennessee, Knoxville). J. Chem. Phys. 22, 36-9(1954) Jan.

A detailed account of the appearance of and the constants derivable from the infrared absorption spectra of the active fundamentals ν_2 and ν_3 of $C^{14}O_2$ is given. The following constants have been determined: $\nu_2 = 632.20$ cm^{-1}, $\nu_3 = 2225.85$ cm^{-1}, $B_{000} = 0.39078$ cm^{-1}, $\alpha_3 = 0.00293$ cm^{-1}. The harmonic frequencies ω_i and the anharmonic constants x_{ij} for the three isotopic species have been determined. Excellent agreement is obtained between observed and calculated band centers. (auth)

SYNTHESES

*2159

Ames Lab.

THE PREPARATION, PURIFICATION AND SOME ANALYTICAL APPLICATIONS OF $\alpha, \beta, \gamma, \delta$-TETRAPHENYLPORPHINE. John Howard Priesthoff and Charles V. Banks. June 1953. 42p. Contract W-7405-eng-82. (ISC-358)

$\alpha, \beta, \gamma, \delta$-Tetraphenylporphine (TPP) was prepared in quantity by the condensation of pyrrole and benzaldehyde. The reaction was carried out in a sealed bomb, heated at 200°C for 48 hours. A new procedure was developed for decomposing the Zn complex and washing the free-base TPP free of acid and dissolved salts. Two new chromatographic adsorption procedures were developed. One, using activated alumina and chloroform, resulted in 95% pure TPP. The other, using Magnesol and chloroform, resulted in 100% pure TPP. Some preliminary experiments were performed using TPP as an analytical reagent. The results, although not conclusive, indicated that TPP might be used in this capacity. (auth)

URANIUM AND URANIUM COMPOUNDS

2160

Argonne National Lab.

VAPOR PRESSURE OF URANIUM. E. G. Rauh and R. J. Thorn. Jan. 8, 1954. 38p. Contract W-31-109-eng-38. (ANL-5203)

The vapor pressures and the heat of vaporization of liquid U have been measured by collecting a known fraction of the vapor effusing from a Knudsen cell. The deposits were weighed by comparing the number of fissions upon thermal neutron irradiation with the fissions from a standard. The measured rate of vaporization is extremely sensitive to the residual pressure of O_2 in the vacuum at background pressures of the order of 10^{-7} mm Hg. With the aid of a theoretically derived expression the effusion rate can be extrapolated to zero O_2 pressure to yield for the vapor pressure the result that

$$\log p\ (\text{mm}) = -\frac{(23330 \pm 21)}{T} + (8.583 \pm 0.011),$$

over the temperature range 1630 to 1970°K. This expression and heat capacity data for solid U yield a value of 116.6 kcal/mole for the heat of sublimation at 0°K and predict a value of about 4.7 kcal/mole for the heat of fusion. (auth)

*2161

Atomic Energy Project, Univ. of Rochester

SPECTROPHOTOMETRIC STUDIES OF THE URANYL-LACTATE, -MALATE, AND -TARTRATE SYSTEMS IN

ACID SOLUTION. Isaac Feldman and Jean Havill. Dec. 2, 1953. 15p. Contract W-7401-eng-49. (UR-293)

Absorption spectra studies and the application of the method of continuous variations indicate the existence of the following complexes at pH 3.5: a 1:1 uranyl-lactate complex, regardless of the uranyl/lactate ratio present in the system; 1:1 and 2:1 uranyl-malate complexes, the predominance of one or the other form depending on the uranyl/malate ratio in the system; and 1:1, 2:1, and 3:1 uranyl-tartrate complexes, the predominating forms depending on the uranyl/tartrate ratio present. The 1:1 form is the principal species in 1:1 and 1:9 uranyl-malate solutions up to at least pH 4.8. Above pH 3.6, a 1:1 uranyl-tartrate mixture probably contains a small fraction of the 2:1 species. However, a 1:9 uranyl-tartrate solution apparently contains only the 1:1 complex up to at least pH 4.6. (auth)

2162

CONCERNING A NEW VARIETY OF URANIUM HYDRIDE. Roger Caillat, Henri Coriou, and Pierre Perio. Translated by Yvette De Felice from Compt. rend. 237, 812-13(1953). 3p. (AEC-tr-1813)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-510.

ENGINEERING

*2163

Battelle Memorial Inst.

EVALUATION OF PERFORMANCE OF A MODEL HIGH-PRESSURE BOILER. D. D. Foley, R. Q. Wilson, and R. B. Filbert, Jr. Jan. 26, 1954. 18p. Contract W-7405-eng-92. (BMI-899)

Thermal-shock resistance of a ½-in.-tube model boiler was evaluated. This unit, which was the third of three units tested, was subjected to two series of thermal-shock cycles. The first series consisted of 10 cycles that were made with an average inlet-water temperature drop of 107°F at a rate of 3.15°F/sec. A subsequent series of 200 cycles was run with an average inlet-water temperature drop of 259°F at a rate of 2.32°F/sec. Prior to the thermal-shock tests, the He-leakage rate from the tube side to the evacuated-shell side was found to be equivalent to 1.6×10^{-7} cm³/sec of He at STP with 1000-psig He pressure on the tube side. With 2000-psig He pressure on the tube side, the leakage rate increased to 1.8×10^{-7} cm³/sec. After the thermal-shock tests, the boiler was removed from the test loop, the tube side was thoroughly dried, and the He-leak tests were repeated. With 1000-psig He pressure on the tube side, the leakage rate was 4.2×10^{-6} cm³/sec of He at STP. With 2000-psig of He pressure on the tube side, the rate increased to 2.2×10^{-6} cm/sec of He. (auth)

2164

Brookhaven National Lab.

A SIMPLE CHASSIS HOLDER FOR USE WITH RELAY RACKS. Joseph Gotimer and Alfred Weinstien. [1954?] 3p. (BNL-1701)

A holder is described which greatly facilitated the installation or removal of electronic chassis in a simple relay rack. (C.H.)

AEROSOLS

2165

SEMIEMPIRICAL EQUATION OF ELECTROSTATIC PRECIPITATION. Eric A. Walker (Pennsylvania State Coll. State College) and John E. Coolidge (Borg-Warner Central Research Lab., Bellwood, Ill.). Ind. Eng. Chem. 45, 2417-22(1953) Nov.

The laboratory equipment and tests used in a study of the electrostatic precipitation of aerosols at different dust loadings are described. The effects of the following variables are discussed: humidity, voltage, particle size, velocity of the air stream and length of the precipitator, corona current, and resistivity of the dust collected on the plates. The data obtained can be fitted to the equation $E = [1 - \exp(-Kha)(V - V_c(L/v)] \times 100$ where E is precipitator efficiency, h is relative humidity, a is the average particle radius, V is the applied voltage, V_c is the critical corona voltage, L is the precipitator length, and v is air-stream velocity. (J.A.G.)

HEAT TRANSFER AND FLUID FLOW

2166

AN INVESTIGATION OF CIRCULATION IN STEAM-GENERATING TUBES AT HIGH STEAM PRESSURES. M. A. Styrikovich and G. E. Kholodovskii. Translated from Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, 506-28(1951). 33p. (AEC-tr-1433; AEC-tr-1440; WO-27629)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-871.

2167

A HYDRODYNAMIC THEORY OF CHANGES IN THE BOILING PROCESS UNDER FREE CONVECTION CONDITIONS. S. S. Kutateladze. Translated from Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 4, 529-36(1951). 14p. (AEC-tr-1441; W.O. 27630)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-872.

MINERALOGY, METALLURGY, AND CERAMICS

2168

Massachusetts Inst. of Tech.

THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Jan. 30, 1954. 23p. Contract No. AT(30-1)-956. (NYO-6255; MITS-22)

Preparation of quartz samples and radioactive Na for study of Na^+ and Cl^- on quartz is discussed. Adsorption measurements of Ag^+ and I^- on AgI in the absence and presence of lauric acid were made at different pH values. A new method of analysis for radioactive laurate is being investigated. Data are presented on the effects of oxygen, agitation time and pH on desorption of Cu on sphalerite by NaCN. A sample of sphalerite was cleaned in preparation for investigation of adsorption and desorption of Ag on sphalerite. Preliminary measurements on the zeta potential of corrundum in NaOH solutions are presented. Strain energy absorption measurements were made on a pyrex glass rod subjected to longitudinal impact. The radii of vibration in a vibratory ball mill were measured. (J.F.D.)

CERAMICS AND REFRACTORIES

*2169

Massachusetts Inst. of Tech.

THE MEASUREMENT OF THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS—CARBIDES AND NITRIDES. T. Vasilos, W. D. Kingery, and F. H. Norton. Dec. 30, 1953. 33p. Contract AT(30-1)-960. (NYO-3649)

An investigation of cataphoresis, pH and conductometric titrations, and viscosity indicates that TiC, TiN, and ZrN form stable electrocratic suspensions in an acid medium. Hydrogen ions adsorbed on the particle surfaces, together with a diffuse layer of anions, lead to positively charged particles. The thermal conductivity of TiC, SiC, TiN, and ZrN has been measured in the temperature range from 100 to 1000°C. The thermal conductivity of these materials decreases with increasing temperature. Determination of the Wiedemann-Franz ratio indicates that electronic conduction is considerable for TiC, TiN, and ZrN but small for SiC. (auth)

2170

Massachusetts Inst. of Tech.

THE MEASUREMENT OF THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS. QUARTERLY PROGRESS REPORT. F. H. Norton, W. D. Kingery, et al. Jan. 1, 1954. 11p. Contract AT(30-1)-960. (NYO-6441)

Measurement of thermal conductivities have continued with measurement of various soda lime-silica glasses at temperatures up to their softening point. Variation in composition and absorption gave no significant variations in the conductivity measured, and results were quite close to those found for fused-silica glass. Measurements of thermal conductivity in the mullite-corundum system have been completed and indicate a minimum in thermal conductivity below either end member. No simple relationship has been found expressing the thermal conductivity as a function of composition. (For preceding period see NYO-3648.) (auth)

CORROSION

*2171

Battelle Memorial Inst.

CORROSION OF STAINLESS STEELS IN SUPERCRITICAL WATER. H. A. Pray and W. K. Boyd. Feb. 4, 1954. 20p. Contract W-7405-eng-92. (BMI-901)

The corrosion behavior of 10 stainless steels (representing hardenable and nonhardenable grades) has been determined by static tests in degassed supercritical water at 800, 1000, and 1350°F at a pressure of 5000 psi. The materials were evaluated on the basis of weight gain and metallographic examination of sample after exposure to the selected test conditions. The Armco 17-4PH, Armco 17-7PH, and Hastelloy F alloys were the most resistant materials at both 1350 and 1000°F. Inconel X, Type 302 stainless, and Allegheny A-286 were severely attacked at both 1350 and 1000°F, whereas the Hastelloy X and Type 410 stainless show heavy attack at 1350°F only. The Type 347 stainless steel, although exhibiting only moderate weight gains, was severely pitted after exposure at 1350°F. Some pitting was also observed on the sample of Type 309 stainless. In supercritical water + H at 1000°F, the Allegheny A-286 alloy was the only material showing a signficiant reduction in corrosion resulting from the presence of H. All the alloys tested had excellent resistance to 800°F degassed supercritical water after an 84-day exposure. In general, the corrosion in degassed supercritical water at 1350°F was intergranular in nature, whereas at 1000°F only the Inconel X material was selectively penetrated along grain boundaries. All alloys suffered some decarburization and carbide precipitation after exposure at 1350°F. No decarburization or significant phase changes were observed for samples exposed at 1000°F. (auth)

*2172

Columbia Univ.

BIBLIOGRAPHY ON THE CORROSION OF ALUMINUM IN WATER. R. S. MacCormack, S. S. Dayan, H. Paige, and H. Weinshelbaum. July 1953. Contract AT(07-2)-1, DuPont Subcontract AX 294. (CU-1-53-At-dP-Ch.E.)

In connection with reported studies on the corrosion of Al in water, a list of references to unclassified literature has been assembled. The search was originally directed towards finding reports on the corrosion of 99+% Al in conductivity water (approximately 10^{-6} mho/cm) at about 100°C, with heat being transferred from the Al to flowing water both with and without boiling action. References on the corrosion of Al under other conditions have been included where they may be related, including some on Al alloys, natural waters, chemicals in solution, protective films, and atmospheric corrosion. A few pertinent articles about other metals are also included. (auth)

2173

Metallurgical Lab., Engineering Experiment Station, Annapolis

PERFORMANCE OF MATERIALS TESTED IN WATER AT HIGH TEMPERATURE. C. J. Lancaster. Mar. 7, 1952. 12p. (EES-4A(16)966870)

Results of two consecutive 30-day dynamic corrosion tests are reported for 12 materials. The samples were subjected to a static bending stress while being rotated at a peripheral velocity of 11 ft/sec in oxygenated water at 500°F. The appearances and weight losses were determined after each 30-day run. (auth)

2174

Metallurgical Lab., Engineering Experiment Station, Annapolis

CORROSION PROPERTIES OF VARIOUS MATERIALS IN HIGH TEMPERATURE WATERS. C. J. Lancaster and W. L. Williams. Jan. 2, 1953. 23p. (EES-4A(23)966870)

Results are presented for a number of experiments which concern the corrosion behavior of selected alloys in various high-temperature waters. The following tests were included: (a) static tests of prestressed Inconel and Type 302 stainless steel coil springs in 500°F degassed distilled water; (b) static tests of Cr-plated K-Monel panels in natural sea water at 120 and 500°F; (c) static stress-corrosion tests of Type 347 stainless steel in 470°F synthetic boiler feed water solutions; (d) dynamic stress-corrosion tests of 14 materials at 11 fps velocity in 500°F distilled water containing 20 to 30 ml/l of O_2.

2175

THE INFLUENCE OF NATURAL WEATHERING ON THE STRESS CORROSION OF ALUMINUM ALLOYS. Gerhard Schikorr and Gunter Wassermann. Translated from Z. Metallkunde 40, 201-5(1949). 14p. (AEC-tr-1805)

The resistance of Al alloys to stress corrosion was tested at 17 locations having various atmospheres (industrial, city, maritime, and country). Simultaneous laboratory experiments with 3% NaCl solution at 70°C showed good qualitative agreement but did not permit quantitative conclusions concerning the ability of the alloys to withstand weathering. As a means of evaluating the results, the half life (time interval for failure in half of the samples) proved to be superior to the average life, which has been used heretofore. (auth)

GEOLOGY AND MINERALOGY

2176

Battelle Memorial Inst.

PROCESS FOR RECOVERING THORIUM AND RARE EARTHS FROM MONAZITE. A. E. Bearse, G. D. Calkins, J. W. Clegg, and R. B. Filbert, Jr. [1953?] Decl. Feb. 3, 1954. 24p. Contract AT-30-1-GEN-228. (BMI-X-105)

The process which has been developed as a result of the present investigation involves the following operations: reaction of the monazite sand with a hot concentrated aqueous solution of NaOH to convert the metal phosphates of the sand to hydrous metal oxides and Na_3PO_4; separation of the

hydrous metal oxides from the dissolved Na phosphate and excess NaOH; dissolution of the hydrous metal oxides in HCl; precipitation of a Th product by partial neutralization of the acid solution; subsequent precipitation of a high-grade rare earth hydroxide product by further neutralization of the chloride solution. (auth)

2177
Grand Junction Operations Office, AEC
SOME ASPECTS OF DIAMOND DRILLING BY THE ATOMIC ENERGY COMMISSION ON THE COLORADO PLATEAU. Daniel B. Hurley and Merle E. Crew. Oct. 8, 1953. 11p. (RME-56)

The purposes of drilling by the AEC are outlined. The types of drilling done, the types of personnel employed, and present trends in drilling techniques required to supply the desired information are discussed. (J.E.D.)

2178
Columbia Univ.
HEMATITE PSEUDOMORPHS FROM THE TODILTO LIMESTONE GRANTS, NEW MEXICO. INTERIM REPORT. Paul F. Kerr and P. K. Hamilton. Dec. 2, 1953. 9p. Contract AT-30-1-702. (RME-3068)

Hematite pseudomorphs are associated with barite in small veinlets which cut the Todilto limestone. These well developed pseudomorphs are believed to result from the metasomatic replacement of pyrite. Lepidocrocite may have been an intermediate product which was colloidal in nature and altered to form hematite. The limestone country rock which borders the veinlets is essentially a pale pink calcite containing both Fe and Mn as impurities. Along the vein on either side the calcite appears to be recrystallized. The pseudomorphs indicate that pyrite was an earlier vein mineral in the Todilto limestone. This evidence of direct crystallization from solution is significant in view of one of the proposals to the effect that the ore at Grants results from mechanical emplacement. (auth)

2179
Grand Junction Operations Office, AEC
PROSPECTING WITH A COUNTER. Robert J. Wright. Jan. 14, 1953. 46p. (RME-4028)

This booklet summarizes information on field counters—their operation, use, abuse, and their application to prospecting, mining, and geologic problems. Practical problems have been emphasized and theory has been minimized, but it has been necessary to introduce a certain amount of theory in order to provide background material. The limitations of counters have been given special attention, because failure by miners and prospectors to recognize these limitations has sometimes resulted in costly errors. It should be recognized, however, that this booklet cannot explain all the effects measured by all counters under all circumstances. Most effects can be interpreted through the principles discussed herein, but nature does not always seem to follow the rules. (auth)

METALS AND METALLURGY

2180
Columbia Univ. School of Mines
A FUNDAMENTAL STUDY IN THE PRINCIPLES COVERING SEIZING AND GALLING IN METALS. QUARTERLY PROGRESS REPORT NO. 7 [FOR] AUGUST 6, 1953 TO NOVEMBER 6, 1953. E. S. Machlin and W. R. Yankee. 9p. Contract AF-18-600-75. (CU-22-53-AF-75-Met.)

A study was made on the effect of O_2 and N_2 in solution in Ti on the seizability of Ti. The friction coefficient increases in the single phase α region as the solute decreases. The element effecting the resistance to seizure was O_2. Static friction coefficients of various couples are reported. The work of adhesion between liquid Ag saturated with Fe and solid γ iron saturated with Ag is much larger than the value obtained for the interphase interface energy for the saturated interface between Ag and solid γ iron. (For preceding report see CU-20-53-AF-75-Met.) (J.E.D.)

2181
Ames Lab.
THE ALUMINUM-VANADIUM ALLOY SYSTEM. O. N. Carlson, D. J. Kenney, and H. A. Wilhelm. [Feb. 1, 1954]. 28p. [Contract W-7405-eng-82]. (ISC-448)

The Al–V system has been investigated by thermal, microscopic, and x-ray methods. Four intermediate phases, $Al_{11}V$, Al_6V, Al_3V, and Al_8V_5, have been identified from microstructures and from x-ray data. All 4 phases are peritectic in nature. $Al_{11}V$ undergoes a peritectic transformation at 685°C, Al_6V at 735°C, Al_3V at 1360°C, and Al_8V_5 at 1670°C. There is very limited solid solubility of V in Al, but the solid solubility of Al in V is quite extensive. (auth)

*2182
Knolls Atomic Power Lab.
DETERMINATION OF FERRITE IN TYPE 347 STAINLESS STEEL WELD DEPOSITS. W. L. Fleischmann. Nov. 11, 1953. 69p. Contract W-31-109-Eng-52. (KAPL-1011)

The ferrite content of four Type 347 stainless steel weld deposits was determined by magnetic measurements using permeameter, "Magne Gage," and metallographic examination. To ascertain the ferrite content by a magnetic measurement, it was necessary to compare the results at the level of magnetic saturation. At low magnetizing forces the magnetic induction was affected by particle size; thus a lower ferrite content was assumed than was actually present. The chemical composition of the weld deposit depends upon the arc conditions. Therefore, the calculation of the ferrite content by means of the Ni and Cr equivalents of Schaeffler is a function of the technique used by the operator. It also appears that N should be included in the group of elements used to establish the Ni equivalent and that allowance should be made for the weaker carbide-forming tendency of Ta rather than applying the Nb equivalent. A plot of percentage of ferrite vs. intrinsic induction at saturation results in a fairly straight-line relationship for the four weld deposits. (auth)

2183
Horizons, Inc.
RATE OF DIFFUSION OF CARBON IN ALPHA AND IN BETA TITANIUM AS A FUNCTION OF THE TEMPERATURE AND CONCENTRATION. Eugene J. Bucur, F. C. Wagner, Morris A. Steinberg, and John T. Burwell, Jr. Jan. 18, 1954. 34p. Contract DA-36-034-ORD-1157(RD), Interim Technical Report No. 3. (NP-5066)

The diffusion of C in Ti in both the α and β regions was determined by the Van Orstrand-Dewey type of treatment. For two specimens annealed at the same temperature (736°C), the same diffusion coefficients were obtained from an analysis of the data. This tentatively establishes that the ϵ (the interface movement) is directly proportional to the square root of the time at temperature. A logarithmic plot of the diffusion coefficient versus the reciprocal of the absolute temperature, for the data obtained, results in two parallel straight lines for the α and β regions. The experimental activation energy in the α and β range was therefore found to be the same (44,600 cal/mole). The frequency factors were found to be $D_0 = 8.63$ in the α range and $D_0 = 27.75$ in the β range. By substituting the D_0 values for the alpha and beta temperatures in the Arrhenius type equation, $D = D_0 \exp(-Q/RT)$, the diffusion coefficients may be calculated. (auth)

2184
Armour Research Foundation
DEVELOPMENT OF TRANSFORMATION DATA FOR

SPECIAL TITANIUM ALLOYS. INTERIM TECHNICAL REPORT NO. 1 [FOR] JULY 1, 1953–OCTOBER 30, 1953. W. Rostoker and D. J. McPherson. Jan. 12, 1954. 25p. Contract No. DA-11-022-ORD-1292. (NP-5071)

The isothermal transformation characteristics of a Ti alloy containing 4% Cr and 2% Mo were studied. The investigation included the establishment of a TTT chart, metallographic examination of transformed structures, and the measurement of tensile and impact properties of transformed specimens. Some correlation between mechanical properties and structure was recognized. Heat treatment conditions for optimum combinations of tensile and impact properties were established. In addition, heat treatment conditions which induce brittleness were recognized. (auth)

2185

Massachusetts Inst. of Tech.

THERMODYNAMICS OF METAL SOLUTIONS. THEORETICAL ANALYSIS OF DIFFUSION OF SOLUTES DURING SOLIDIFICATION OF ALLOYS. Carl Wagner. July 28, 1953. 32p. Contract AT(30-1)-1002, Scope I. (NYO-7003)

When an alloy solidifies and the composition of the solid differs from the composition of the liquid, atoms of the alloying elements rejected at the solid-liquid interface have to diffuse toward the bulk liquid. Thus the composition of the liquid at the interface differs from the composition of the bulk liquid, and the composition of the solid will be closer to the composition of the bulk liquid as is predicted by the phase diagram. Diffusion may be supported by convection. Theoretical calculations have been made for a liquid without convection, for a liquid involving natural convection, and for solidification of a liquid alloy at the surface of a rotating disc as an example of forced convection. For concentrations of alloying elements below 0.1 at. % a small degree of segregation is predicted unless the solidification rate is extremely low. If, however, the concentrations of alloying elements are higher than about 1%, significant concentration differences between solid and bulk liquid occur because then a plane solid-liquid interface is unstable, dendrites are formed, and local solidification rates are relatively low. (auth)

*2186

Massachusetts Inst. of Tech.

THERMODYNAMIC PROPERTIES OF SOLID ALUMINUM-ZINC ALLOYS. J. E. Hilliard, B.L. Averbach, and Morris Cohen. Dec. 1, 1953. 41p. Contract AT(30-1)-1002, Scope 2, Technical Report No. 18. (NYO-7037)

The relative thermodynamic properties of solid Al–Zn alloys have been determined over the complete composition range by means of a galvanic cell using a molten-salt electrolyte. The results evaluated at 300 and 380°C indicate that there is a substantial positive deviation from ideal behavior. The molar heat of mixing has a maximum value of 850 cal/g-atom (heat absorbed) at about 60 at. % Zn, and the entropies of mixing are slightly greater than the ideal configurational values. For the Al-rich solutions, the partial quantities relative to Al are apparently consistent with the quasi-chemical theory, but there are large deviations from the theory in the solutions containing more than 40 at. % Zn. Extrapolation of the data for solid alloys indicates that the maximum heat of mixing for the liquid alloys is 440 cal/g-atom. (auth)

2187

Massachusetts Inst. of Tech.

FUNDAMENTALS OF COLD WORKING AND RECRYSTALLIZATION. PROGRESS REPORT NO. 13. B. L. Averbach, M. Cohen, S. Allen, M. F. Comerford, and C. Houska. Dec. 31, 1953. 3p. Contract AT(30-1)-1002, Scope 3. (NYO-7069)

The changes that take place during plastic deformation and subsequent annealing of single crystals were studied by means of x-ray spectrometer techniques. Samples of Ag-Au alloy filings were annealed at temperatures up to 500°C. Complete recrystallization occurred at 350°C. Alpha brass single crystals were studied to provide a better insight into the mechanics of the deformation and annealing processes. (For preceding report in series see NYO-7069.) (J.E.D.)

2188

General Electric Co.

FLASH-WELDED PROPERTIES OF Ti 140A TITANIUM ALLOY. S. J. Whalen. Oct. 5, 1953. 8p. (R53AGT266)

2189

American Electro Metal Corp.

NEW HIGH-TEMPERATURE INTERMETALLIC MATERIALS. William Arbiter. May 1953. 91p. Contract AF-33(616)-109. (WADC-TR-53-190; AD-18120)

The details of the preparation and the testing of intermetallic compounds are reported. A composition whose starting components were 95% Cr_2Ti and 5% Cr_2O_3 has shown promising high temperature properties, including good oxidation resistance and high stress-to-rupture strength. Additional compositions have been tested, and several appear to be of interest. (auth)

2190

CONCERNING TERNARY AND QUATERNARY EUTECTIC ALLOYS. Ernst Janecke. Translated from Z. Metallkunde 29, 367-73(1937). 14p. (AEC-tr-83)

Ternary alloys, after the investigation of the binary system were found to form simple ternary eutectics. The quaternary systems containing the metals Bi, Cd, Pb, and Sn with Zn or Tl were observed somewhat more accurately. The Zn-containing system has only a simple quaternary eutectic. In the case of the Tl-containing type, more eutectics as well as the quaternary eutectic were found. The effect of a 5th metal on the freezing point of Woods alloy was discussed. Only in the case of mixed crystal formation (Tl) is the freezing temperature of the quaternary eutectic lowered. Observations were made concerning the methods of freezing of 5 metals. The eutectic never contains more than 4 constituents. (auth)

2191

CONTRIBUTION TO THE INVESTIGATIONS INTO THE GAS WELDING OF ALUMINUM WITH OTHER METALS. H. Holler and A. F. Maier. A Partial Translation from Autogene Metallbearbeit 28, 177, 179-83, 187(1935). 7p. Available from Henry Brutcher (Trans. No. 2913), Altadena, Calif. (AEC-tr-1800)

Methods in which a high-strength bond can be obtained between Al and Cu (wire and sheet) by gas welding or brazing are presented. Soldering Sn, cast-Al rod, and pure Al are discussed as materials used for coating the Cu sheet or wire to be joined. Results obtained with Al and Cu wire, braid, and sheet of different thicknesses are given. Data on mechanical strength and corrosion resistance of welded and brazed joints are reported. (auth)

2192

IS COLUMBIUM NECESSARY IN THE FILLER WIRE (FOR WELDING 18-8 STAINLESS). I. Z. Kagan. Translated from Avtogennoe Delo 22, 26-7(1951). 5p. Available from Henry Brutcher (Trans. No. 2731), Altadena, Calif. (AEC-tr-1801)

Practical experiences in manual and automatic arc welding of stainless steels with Nb-containing vs. Nb-free electrodes are reported. Welding failures (low ductility, hot short cracks) with Nb contents of over 1% in the electrode are discussed, together with the maximum permissible C

content. Suggested practices for welding 18-8 and 18-8 Ti steels are given. (auth)

2193
WEAR RESISTANCE OF CARBON STEEL SUBJECTED TO RUBBING IN CERTAIN LIQUID MEDIA AFTER DIFFUSION CHROMIZING. M. M. Khrushchov, M. A. Babichev, and G. N. Dubinin. Translated from Doklady Akad. Nauk S.S.S.R. 92, 303-6(1953). 4p. (NSF-tr-196)

It is shown that, despite a ninefold increase in hardness, the wear resistance of C steel was lower after chromizing than before. This indicates that hardness does not determine the wear resistance of steels of different structure and composition when subjected to rubbing in water. The dependence of the wear resistance of C steel that has been Cr enriched by diffusion chromizing on the C content, on the hardness of the surface layer, and on the properties of the liquid medium at the rubbing surface is shown. (auth)

2194
THE CONSTITUTION OF ALUMINIUM–COPPER–SILICON ALLOYS. H. W. L. Phillips (Research Labs. of the British Aluminium Co., Ltd., Gerrards Cross, Bucks, England). J. Inst. Metals 82, 9-15(1953) Sept.

The constitution of the Al-rich alloys of the Al–Cu–Si system has been investigated both as slowly cooled and under conditions of equilibrium, the range covered being 0 to 40% Cu and 0 to 15% Si. The system is eutectiferous, with a eutectic of Al, $CuAl_2$, and Si containing 26.70% Cu and 5.25% Si, freezing at 524°C. The Al-rich apex of the ternary eutectic plane was found to lie at 4.9% Cu and 1.1% Si, under conditions of equilibrium, and at 0.25% Cu and 0.25% Si, under conditions of cooling likely to be met with in industrial practice. The section $CuAl_2$ Si is quasi-binary, with a eutectic containing approximately 50% Cu and 4.4% Si, freezing at 571°C. The solid solubility of Cu and Si in Al was determined at 500 and 400°C. At these temperatures, the composition of the solid solution, fully saturated with respect to both components, was found to be 4.1% Cu and 0.85% Si (500°C) and 1.5% Cu and 0.25% Si (400°C). The solid solubility of either Cu or Si in Al was little, if at all, affected by the presence of the other component. (auth)

PHYSICS

2195
Los Alamos Scientific Lab.
SHOCK HUGONIOT OF GASES. W. E. Deal, Jr. [nd]. Decl. Feb. 23, 1954. 7p. [Contract W-7405-eng-36]. (AECD-3614)

When an explosive-driven metal moves into a gas, a strong shock is set up in that gas. A technique for determination of the dynamic pressure-compression curve for gases undergoing such shocks is presented. (auth)

2196
Laboratory for Nuclear Science, Mass. Inst. of Tech.
PROGRESS REPORT NO. 31 [FOR] SEPTEMBER 1, 1953 TO NOVEMBER 30, 1953. Nov. 30, 1953. 84p. Contracts AT(30-1)-905 and N5ori-07806. (AECU-2810)

Separate abstracts have been prepared for four sections of this report. (For preceding period see AECU-2740.) (J.S.R.)

2197
Los Alamos Scientific Lab.
THE SLOW COMPONENT IN THE DECAY OF FLUORS. F. B. Harrison. [1953] 10p. Contract W-7405-eng-36. (AECU-2812)

Results are presented on the decay times and the fraction of light emitted for the slow component in the fluorescent decay of scintillation crystals, plastics, and liquids. (auth)

2198
Argonne National Lab.
PHYSICS DIVISION QUARTERLY REPORT [FOR] JUNE, JULY, AND AUGUST 1953. Nov. 1953. 104p. Contract W-31-109-eng-38. (ANL-5140)

Experimental Nuclear Physics. The neutron capturing efficiency of an infinite-slab liquid scintillation neutron counter has been completed by Monte Carlo calculations. The mean capture time in a liquid counter 2 cm thick was also obtained, showing that these values do not differ greatly from those of an infinite medium. Further data are reported on the neutron total cross sections of Ga^{71}, Ga^{69}, Ge, Nb, Tl, Zr, Zn, Sb^{123}, Hg^{199}, Hg^{201}, and Se. An instability in the ion beam position of the Van de Graaff generator has been noted, with partial elimination of the problem achieved by relocating the aperture of the focusing assembly. Energy levels of 2.2, 3.4, and 6.8 Mev were not observed in Be^8, as previously reported by Erdos, Scherrer, and Stoll (Helv. Phys. Acta 26, 207(1953)). New data are given on decay schemes of Hg^{205}, V^{52}, Cd^{117}, In^{117}, Dy^{165}, Gd^{159}, Gd^{161}, V^{48}, and Sc^{48} and on the internal conversion γ spectra of Tb^{160}. A table of revised data is presented on the γ radiations by radiative capture for several isotopes of mass number between 72 and 199. A redetermination of the number of neutrons emitted by a Ra–Be source yielded a value of 5.67×10^6 neutrons/sec ± 3%. Preliminary data on the spectrum (3914 to 5610 A) of T are reported. Mass Spectroscopy. The normal isotopic constitution of Hf has been measured for 6 isotopes. Crystallography. Unit cell dimensions and the values for 42 parameters have been evaluated for triclinic $B(OH)_3$. Theoretical Physics. Two-nucleon excitation calculations of the first excited state of O^{16} do not satisfactorily account for the observed results concerning the J = 0 and J = 6 levels. One-dimensional, non-plane-wave solutions of the Dirac equation have been obtained as part of a program concerned with renormalization and particle-field coupling. S-matrix formulation is presented for the Compton scattering effect, neglecting γ-matrix representations and the initial electron at rest with respect to the γ ray. (For preceding period see ANL-5080.) (K.S.)

2199
Applied Physics Lab., Johns Hopkins Univ.
SHOCK-WAVE BIBLIOGRAPHY OF PERIODICAL LITERATURE. F. K. Elder, Jr. Mar. 1953. 82p. (APL/JHU-TG-75-3; AD-12032)

This bibliography on the physics of shock waves was prepared from the periodical literature for the period from 1920 through 1952, with a few earlier and later references included. (C.H.)

2200
Ames Lab.
QUARTERLY SUMMARY RESEARCH REPORT IN PHYSICS FOR JULY, AUGUST, AND SEPTEMBER 1953. Dec. 15, 1953. 20p. Contract W-7405-eng-82. (ISC-422)

Investigation of the theoretical effects of electronic quadrupole-quadrupole interactions on the specific heat of Ce was continued. Arrangements were found with energies lower than expected, if all ions are considered to have identical electron charge distributions. The positron spectrum of Cl^{34} was found to consist of 3 groups with maximum energies of 4.46 ± 0.2, 2.49 ± 0.02, and 1.29 ± 0.03 Mev. The low-energy γ line was found to be at 0.139 ± 0.001 Mev. The ionization defect for fission fragment distribution measurements in ionization chambers has been extended to include A, Kr, Ne, A + 3% CO_2, and A + 5% N_2. A measurement of the aver-

age ionization energy for ion-pair production by α particles from U^{234} and U^{238} resulted from these investigations. Electron transmission measurements and range-energy relations were studied for Al and various plastics. The results were in agreement with Bethe's energy-loss formula. A decay scheme for Sb^{125} was determined from scintillation spectrometer measurements. Several physical properties of Na–W bronze crystals were determined as a function of WO_3 content. Coefficients of linear thermal expansion at room temperature were measured for several rare earth metals. (For preceding period see ISC-395.) (K.S.)

*2201

North American Aviation, Inc.

THE DEBYE TEMPERATURE OF $AuCu_3$ AS A FUNCTION OF LONG RANGE ORDER PARAMETER. D. B. Bowen. Nov. 30, 1953. 12p. Contract AT-11-1-GEN-8. (NAA-SR-835)

Simultaneous measurements of resistance have been made on partially ordered and disordered $AuCu_3$ wires. The resistance measurements are made over the temperature range from 4.2 to 77°K. The differing behavior of the temperature-dependent portions of the resistivities of the 2 wires has been interpreted as an increase of Debye temperature in the ordered sample. The total change observed from disorder to complete order is 22°. Some thermodynamic implications of these changes are discussed. A suggestion is made that the appearance of long range order, as distinguished from short range order, must be accompanied by changes in the spectrum of lattice oscillation. The bases for this suggestion are presented. (auth)

2202

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

[NEUTRON AND GAMMA RAY SHIELDING GROUP AND ELECTRONICS NUCLEAR INSTRUMENTATION GROUP] PERIODIC STATUS REPORT NO. 10 [FOR JANUARY 1, 1950 TO APRIL 1, 1950]. Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech. and Servomechanisms Lab., Mass. Inst. of Tech. Apr. 1, 1950. 33p. Contract N5ori-07818. (NP-1847)

2203

Iowa State Coll.

ORGANO-METALLIC AND ORGANO-METALLOIDAL HIGH TEMPERATURE LUBRICANTS AND RELATED MATERIALS. QUARTERLY PROGRESS REPORT [FOR] SEPTEMBER 15, 1953 TO DECEMBER 14, 1953. 17p. Contract AF-33(616)-94. (NP-5058)

New and improved procedures have been worked out for the preparation of reactive compounds for the synthesis of "custom-made" molecules. Compounds like R_3SiM and R_3GeM (where M is a reactive metal like Li, Na, or K) can now be made more conveniently. Additional new compounds have been screened for their thermal stabilities. The screening of 105 organometallic and organometalloidal compounds is tabulated. A series of isomeric octyl groups are being introduced into more promising types in order to establish more definitely the most favorable kind of branching in a group like the octyl. Carbazole and substituted carbazole groups are being studied because of their promising effects on thermal stability. (auth)

2204

NEW METHOD FOR MEASURING THE SPECIFIC SURFACE OF POROUS BODIES AND POWDERS. B. Deryagin, R. Fridlyand, and V. Krylova. Translated from Doklady Akad. Nauk S.S.S.R. 61, 653-6(1948). 9p. Available from Henry Brutcher (Trans. No. 2779), Altadena, Calif. (AEC-tr-1799)

A formula for Knudsen gas flow through porous bodies and the design of an apparatus and procedure for measuring the specific surface are given. Data were obtained with the proposed method on soil, cement, silica gel, corundum powder, ZnO, and $BaSO_4$. The theory underlying this method and the dependability of the new method as compared with the others in current use are discussed. (J.E.D.)

2205

INVESTIGATION INTO THE INFLUENCE OF ULTRASONICS UPON THE ELECTRODEPOSITION OF COPPER AND ZINC. Th. Rummel and K. Schmitt. Translated from Korrosion u. Metallschutz 19, 101-4(1943). 12p. Available from Henry Brutcher (Trans. No. 1719), Altadena, Calif. (AEC-tr-1810)

2206

LIQUID HELIUM FILMS. K. R. Atkins (Univ. of Toronto, Canada). Phys. Rev. 92, 1571-2(1953) Dec. 15.

A qualitative picture of the kinetics for unsaturated liquid He films is given from arguments based on the Polanyi potential theory. Entropy considerations of the inner and outer portions of the film contribute to an understanding of the flow characteristics and specific heat of the films. (K.S.)

2207

SPECIFIC HEAT OF He^3 BETWEEN 1.3°K AND 2.3°K. G. de Vries and J. G. Daunt (Ohio State Univ., Columbus). Phys. Rev. 92, 1572-3(1953) Dec. 15.

Calorimetric measurements of the specific heat of He^3 in the range 1.3 to 2.3°K are reported. A plot of the results yields a monotomic curve, convex to the temperature axis, leading to a rejection of Fermi-Dirac functions. Tentative interpretations of the results are discussed. (K.S.)

ASTROPHYSICS

2208

THE STATISTICAL MECHANISM OF THE ACCELERATION OF PARTICLES ON THE SUN AND IN STELLAR SHELLS. V. L. Ginzburg. Translated from Doklady Akad. Nauk S.S.S.R. 92, 727-30(1953). 4p. (NSF-tr-207)

The efficiency of the statistical mechanism on the sun and in stellar shells for the acceleration of particles in interstellar space is demonstrated. The injection energy $E_{k,i}$ for the case of a moving nonrelativistic particle in ionized gas is derived. It is shown that by increasing the injection energy, only a small portion of the particles is accelerated. (J.S.R.)

COSMIC RADIATION

2209

PRODUCTION OF FAST LITHIUM, BERYLLIUM, BORON FRAGMENTS FROM INTERACTIONS OF PRIMARY COSMIC-RAY NUCLEI. J. H. Noon, M. F. Kaplon, and D. M. Ritson (Univ. of Rochester, New York). Phys. Rev. 92, 1585-6(1953) Dec. 15.

Ilford G-5 stripped emulsions were exposed to heavy cosmic-ray nuclei of energy ≥ 0.7 bev. The primary nuclei were divided into two groups: medium nuclei (M) of $6 \leq Z \leq 10$ and heavy nuclei (H) of $Z > 10$. The probability of production of L nuclei (Li, Be, B) for the two groups was found to be $P_{ML} = 0.36 \pm 0.11$ and $P_{HL} = 0.34 \pm 0.11$. Considering interactions with the H of the emulsion only, $P_{ML} = 0.83 \pm 0.5$ and $P_{HL} = 0.8 \pm 0.5$. By adopting a particular geometric model defining an effective overlap region for light-element production, it is shown that the probability for production of L nuclei in atmosphere is $P_{ML} = 0.56 \pm 0.18$ and $P_{HL} = 0.49 \pm 0.17$. (K.S.)

ELECTRICAL DISCHARGE

2210

DETERMINATION OF VAPOR DENSITY BEHIND THE ANODE AND BEHIND THE CATHODE OF A DISCHARGE TUBE. A. M. Shukhtin. Translated from Doklady Akad. Nauk S.S.S.R. 92, 289-91(1953). 4p. (NSF-tr-193)

As an electrical discharge is accompanied by a decrease

in the vapor density in the region of the anode glow, it was thought that the discharge current might have some effect on the vapor density behind the anode and cathode of the tube. The vapor density was measured by the optical method using a Rozhdestvenskii interferometer. From the results of the experiment, it was concluded that the discharge current produces practically no change in the vapor density behind the anode and cathode of a discharge tube. (J.S.R.)

ELECTRONS

2211

ELECTRON-CASCADE PROCESSES AT VERY HIGH ENERGIES. L. Landau and I. Pomeranchuk. Translated from Doklady Akad. Nauk S.S.S.R. 92, 735-8(1953). 4p. (NSF-tr-210)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-1613.

GASES

*2212

Carbide and Carbon Chemicals Co. (K-25)

PROPERTIES OF THERMAL CONDUCTIVITY CELLS WITH HEAVY GASES. H. S. McKown. Jan. 29, 1954. 19p. Contract W-7405-eng-26. (K-1099)

A series of experiments was carried out to determine a thermal conductivity cell shape that would be suitable for the analysis of pairs of both heavy and light gases. The Gow-Mac Instrument Co. type MT30S and several laboratory-made cells were compared. A precision of ±0.2% in concentration was attained with CO_2-SF_6 mixtures using either the Gow-Mac cell or the optimum laboratory-made cell. (auth)

INSTRUMENTS

*2213

Argonne National Lab.

INSTRUMENT RESEARCH AND DEVELOPMENT DIVISION QUARTERLY PROGRESS REPORT FOR SEPTEMBER, OCTOBER, AND NOVEMBER 1953. Dec. 1953. 21p. Contract W-31-109-eng-38. (ANL-5177)

Investigations on the β ionization and average ion-pair production energy for air, N_2, O_2, CO_2, A, Kr, and Xe in ion chambers demonstrated further difficulties in accounting for the observed results. Improvements in plastic scintillator counting are continuing in the direction of obtaining increased light output, better counting efficiency, and the detection of low-energy neutrons. Studies of the scintillation decay time and response characteristics of typical photomultiplier tubes are reported in detail. Discrepancies with theory on the nature of the spread introduced by such tubes indicate a non-Gaussian response. The observed characteristics were found to closely resemble an inverse power law. Temperature drifts in a fluorescence photometer have been reduced by replacing the U glass by a U-in-NaF melt, sealed in a transparent envelope. Graphs of the electric polarization current vs. time and of steady state vs. temperature are presented for lucite. (For preceding period see ANL-5118.) (K.S.)

*2214

Hanford Works

A TRANSISTOR HIGH VOLTAGE POWER SUPPLY. G. E. Driver. Jan. 21, 1954. 11p. Contract W-31-109-Eng-52. (HW-30602)

A transistor 900-v supply was constructed for use in portable Geiger and scintillation counter instruments. The battery life of 7 Hg cells was 440 hr with an output voltage drop of 0.55%. Temperature and humidity changes produced a negligible output voltage variation. (auth)

*2215

North American Aviation, Inc.

THE CALIBRATION OF A HIGH TEMPERATURE RADIATION CALORIMETER. R. J. Graydon and R. L. Carter. Feb. 15, 1954. 25p. Contract AT-11-1-GEN-8. (NAA-SR-267)

A high-temperature calorimeter is described, through the use of which it is possible to evaluate specific heat in terms of spectral emissivity for various materials in the temperature range from 350 to 1400°K. Calibration of the calorimeter is detailed, and its limitations are enumerated. (auth)

*2216

Oak Ridge National Lab.

A HIGH TEMPERATURE X-RAY CAMERA. J. R. Johnson. Feb. 25, 1954. 11p. Contract W-7405-eng-26. (ORNL-1542)

A high-temperature x-ray camera capable of operating as high as 2200°C is described. The specimen is heated by a simple Ta resistance heater. Temperature control is maintained by a constant power input. A sliding film holder permits a number of successive pictures to be taken without disturbing the specimen or apparatus. (auth)

2217

Chalk River Project (Canada)

ELECTRONICS BRANCH PROGRESS REPORT [FOR] OCTOBER TO DECEMBER 1953. J. Hardwick. 15p. (PR-P-20-E)

A survey meter of high sensitivity, wide range, and low voltage demand has been designed, replacing the ion chamber and electrometer tube by a scintillation detector. An improved contamination meter design is described which avoids blocking up to very high dose rates. Evidence has been accumulated which indicates that loss of emission in thermionic tubes is not due to gas poisoning. Transistor tests confirm a junction temperature rise of 0.25°C/mw. Less erratic results were obtained from hermetically sealed units. (For preceding period see PR-P-19-E.) (K.S.)

2218

PREPARATION OF UNUSUAL TARGETS FOR CYCLOTRON STUDIES. N. S. Wall and J. W. Irvine, Jr. (Mass. Inst. of Tech., Cambridge). Rev. Sci. Instr. 24, 1146-7(1953) Dec.

A technique is described for the preparation of thin self-supporting samples of elements which cannot be readily prepared as thin foils. (K.S.)

2219

SELF-OPERATING SINGLE-CRYSTAL FURNACE. W. H. Bridges, G. P. Smith, and J. V. Cathcart (Oak Ridge National Lab., Tenn.). Rev. Sci. Instr. 24, 1149-50(1953) Dec.

A self-operating apparatus for growing single crystals of metals by the Bridgman method of slowly cooling a melt is described. (K.S.)

ISOTOPES

2220

Brookhaven National Lab.

PRODUCTION OF IODINE-132. L. G. Stang, Jr., W. D. Tucker, H. D. Banks, Jr., R. F. Doering, and T. H. Mills. [1954?] 18p. (BNL-1727)

The present-day importance of I^{131} is mentioned. A few characteristics of I^{132} are indicated which make it potentially superior to I^{131} for some medical purposes. A method is outlined whereby this short-lived isotope can be made available for use at some considerable distance from a nuclear reactor. Equipment is described with which to carry out this method. Inherent features of this method include simplicity of operation on the part of the user, minimization of personnel exposure to radiation, and samples of high purity both from a radioactivity and a

chemical standpoint. The half-life of I^{132} was determined to be 2.33 ± 0.02 hr. (auth)

*2221

Oak Ridge National Lab.

THE INVENTORY OF ELECTROMAGNETICALLY ENRICHED ISOTOPES. C. P. Keim, C. E. Normand, and Boyd Weaver. Mar. 5, 1954. 47p. Contract No. W-7405-Eng-26. (ORNL-1691)

This inventory lists the isotopes which have been concentrated electromagnetically, along with their enriched abundances, the element weights, and product forms available in milligram quantities to users on AEC projects and in university and industrial laboratories. Occasional isotope lots are listed which have been exhausted, but their enriched isotopic abundance indicates what may be expected on inventory replenishment. (auth)

2222

Radiation Lab., Univ. of Calif., Berkeley

PRODUCTION OF H^3 AND He^3 IN HIGH-ENERGY DEUTERON-DEUTERON COLLISIONS (thesis). Charles S. Godfrey. Nov. 2, 1953. 63p. Contract W-7405-eng-48. (UCRL-2393)

The differential cross section for the process $d + d \rightarrow H^3 + p$ has been measured at six angles extending from 20 to 85° in the center-of-mass system. Deuterons of 190 Mev from the Berkeley 184-in. synchrocyclotron were used. A coincidence counting system, consisting of scintillation counters for both particles, was employed. Time of flight and range of the particles were used, both in identifying the process and in discriminating against background. The resulting cross section is highly peaked in the forward direction. The behavior is explained qualitatively by a theoretical calculation based on an extension of the stripping mechanism first proposed by Serber. The total cross section for the reaction is estimated to be 4.1 mb. The relative production of H^3 from the above process and of He^3 from the process $d + d \rightarrow He^3 + n$ has been measured at 30° center-of-mass. The method of detection required that the particles traverse a magnetic channel and a pulse-height counter telescope. The pulses were displayed on a fast cathode-ray oscilloscope and recorded photographically. A liquid-deuterium target was employed. The comparison shows a ratio of H^3 to He^3 of 0.86 ± 0.14. These data support the hypothesis that charge symmetry of nuclear forces exists at high energy. (auth)

ISOTOPE SEPARATION

2223

ELECTROMAGNETIC SEPARATOR FOR ISOTOPES OF LIGHT AND AVERAGE ELEMENTS. (Séparateur Électromagnétique pour les Isotopes d'Éléments Légers et Moyens). René Bernas. Translated from J. phys. radium 14, 34-42(1953). 17p. (AEC-tr-1808)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 7-2042.

MATHEMATICS

2224

[Los Alamos Scientific Lab.]

AN EMPIRICAL DISTRIBUTION FUNCTION FOR SAMPLING WITH INCOMPLETE INFORMATION. H. D. Brunk, G. M. Ewing, W. T. Reid, and Edward Silverman. [1953?] 13p. [Contract No. W-7405-eng-36]. (AECU-2813)

2225

THE PROJECTIVE TRANSFORMATION OF NOMOGRAPHS. M. V. Pentovskii [Pentovskiy]. Translated from Uchenye Zapiski, Moskov. Gosudarst. Univ. M. V. Lomonosova [No.] 28, 115-40(1939). 46p. (AEC-tr-1811)

2226

ON ANALYTICAL APPARATUS OF PHYSICAL STATISTICS. A. Ya. Khinchin. Translated from Trudy Mat. Inst. im. V. A. Steklova 33, 3-83(1953). Feb. 1954. 43p. (AEC-tr-2057)

Mathematical derivations of asymptotic formulas of physical statistics and substantiation of the representability of the mean values obtained are presented. It is shown that modern probability theory provides analytical methods, the elementary application of which makes it possible, rigorously and accurately, to substantiate all the most important formulas of quantum statistics without establishing any new analytical apparatus. (J.A.G.)

MEASURING INSTRUMENTS AND TECHNIQUES

*2227

Hanford Works

PHOSPHOR PLATES FOR ALPHA SCINTILLATION COUNTING. G. E. Driver and P. L. Eisenacher. Jan. 21, 1954. 11p. Contract W-31-109-Eng-52. (HW-30601)

A method for casting α scintillation phosphors from styrene and zinc sulfide is described, and properties of such phosphors are outlined. Cast phosphor plates for survey instruments are about 80% efficient for 5-Mev α particles, and the light shield has a density of 0.8 mg/cm² or less. (auth)

*2228

Livermore Research Lab., Calif. Research and Development Co.

NEUTRON DETECTOR PERTURBATIONS. S. H. Fitch and J. E. Drummond. Feb. 1954. 25p. Contract AT(11-1)-74. (LRL-95)

In experimental physics, activation detectors for the measurement of thermal and resonance neutron flux are used. One problem in this type of measurement is the alteration of the flux caused by the difference in the absorption and scattering properties of the detector from those of the media in which measurements are to be made. In order to evaluate these effects, measurements have been made on the self-absorption and self-perturbation of In foil and wire detectors in various media. Data were taken on the γ counting rates of the samples to avoid the errors due to β self-absorption which have been encountered in the usual experimental techniques. Calculations of these perturbations have been made using transport theory to correlate and extend the experimental data. (auth)

2229

[NEPA Div., Fairchild Engine and Airplane Corp.]

PRODUCTION OF 90% ALUMINUM 10% INDIUM FOIL. R. F. Lutz. Mar. 14, 1951. 7p. [Contract W-33-08-ac-14801(16250)]. (NEPA-1C-51-3-29)

2230

Naval Medical Research Inst., Bethesda

DEVELOPMENTAL STUDIES OF PERSONNEL DOSIMETERS FOR IONIZING RADIATION. 1. BACKGROUND AND PRELIMINARY DATA ON THE USE OF ACTIVATED POTASSIUM BROMIDE CRYSTALS. Maynard Eicher. May 29, 1950. 13p. (NM-006-012.04.27)

*2231

New York Operations Office, AEC

MIXED BETA-GAMMA EXPOSURES IN FILM BADGE DOSIMETRY. Leonard R. Solon. Dec. 1953. 7p. (NYO-4565)

An experiment is reported in which mixed exposures of β radiation from UX-1 and UX-2 and γ radiation from filtered Ra^{226} have been imposed on dental x-ray film cassettes. Commutativity of the resulting densities and the functional connection between density and exposure are established. Reproducibility of film development procedure and interactions between the mixed exposures are also investigated. (auth)

*2232
Oak Ridge National Lab.
ROTATING PRISM FOR USE WITH CLOUD CHAMBERS. Bernard G. Saunders. Feb. 15, 1954. 13p. Contract W-7405-eng-26. (ORNL-1657)

The use of a rotating prism for observing moving cloud-chamber droplets and measuring their velocities is discussed. Equations are developed for computing displacements of droplets and their rates of displacement as a function of the prism's angular displacement and velocity. Also discussed are the limits of displacement and velocity of droplets that can be observed. (auth)

2233
A NEW QUENCHING EFFECT IN LIQUID SCINTILLATORS. R. W. Pringle, L. D. Black, B. L. Funt, and S. Sobering (Univ. of Manitoba, Winnipeg, Canada). Phys. Rev. 92, 1582-3(1953) Dec. 15.

The presence of dissolved O_2 in liquid scintillators is shown to have a pronounced quenching effect on samples of terphenyl–xylene and diphenyloxazole–p-xylene. References with the light output of an anthracene crystal indicated that removal of O_2 by bubbling N_2 through the scintillation cell increased the pulse heights from a Dumont 6292 photomultiplier tube to a substantial degree. Rebubbling with O_2 reversed the effect. Photo-oxidation and photodimerization processes are thought to account for the observed results. (K.S.)

2234
A COMPACT REAR-ILLUMINATION SYSTEM FOR CLOUD CHAMBERS. E. W. Cowan (Calif. Inst. of Tech., Pasadena). Rev. Sci. Instr. 24, 1104-6(1953) Dec.

The use of cylindrical mirrors made of bent plate glass results in a rear-illumination system for cloud chambers that is compact and gives good contrast with more than adequate light intensity. A small balloon-borne cloud chamber using this system requires only 6 j of energy for the light, using a lens opening of f/40. The mirrors are made in an inexpensive way from plate glass by heating the glass and allowing it to sag into a mold of the proper shape. (auth)

2235
DESIGN AND TRAJECTORIES FOR A MAGNETIC LENS NUCLEAR SPECTROMETER. L. A. Kiley, W. S. Emmerich, Y. Nogami, and J. D. Kurbatov (Ohio State Univ., Columbus). Rev. Sci. Instr. 24, 1145-6(1953) Dec.

The construction details of a magnetic lens-type spectrometer for measuring β- and γ-ray energies up to 6 Mev are described. (K.S.)

2236
SCINTILLATION COUNTING OF NATURAL RADIOCARBON: I. THE COUNTING METHOD. James R. Arnold (Univ. of Chicago). Science 119, 155-7(1954) Jan. 29.

Techniques of counting natural radiocarbon are reviewed. A method is described for increasing the sensitivity of a scintillation counter to allow the measurement of natural C^{14} to a precision of 0.46% in 48 hr. A block diagram of the apparatus and counting data are included. (C.H.)

MESONS

2237
Radiation Lab., Univ. of Calif., Berkeley
THE PHOTOPRODUCTION OF π^0 MESONS FROM HYDROGEN AND DEUTERIUM (thesis). Calvin G. André. Nov. 1953. 54p. Contract W-7405-eng-48. (UCRL-2425)

The production of neutral π mesons by the 325-Mev photon beam of the Berkeley synchrotron has been measured for H and D at 90° to the x-ray beam. The cross section ratio of the D to that of H was obtained, $\sigma_D/\sigma_H \simeq 2$, independent of meson energy. The angular distribution of the π^0 mesons produced by 252-Mev incident photons on H was fitted to an $(a + b \sin^2\theta)$ law giving the ratio of $b/a = 2.9 \pm 1$ (probable error). The π^0 mesons were detected by observing the decay γ rays in coincidence. (auth)

2238
ON THE THEORY OF STRONG COUPLING. B. T. Geilikman. Translated from Doklady Akad. Nauk S.S.S.R. 91, 39-42(1953). 5p. (NSF-tr-191)

The interaction of a pseudoscalar field with infinitely heavy particles in motion is investigated by a formally nonrelativistic Hamiltonian. The wave functions of the heavy particles in motion are derived. (J.S.R.)

2239
VACUUM POLARIZATION IN THE THEORY OF STRONG COUPLING. B. T. Geilikman. Translated from Doklady Akad. Nauk S.S.S.R. 91, 225-8(1953). 4p. (NSF-tr-192)

A qualitative estimate of the interaction caused by a nucleonic vacuum in the case of strong coupling is given. The field determining the interaction of heavy particles is classical. The nonlinearity of the field of "true mesons" in a strong-coupling theory which contains no divergences is found to be small. (J.S.R.)

2240
OBSERVATION OF THE STOPPING OF HEAVY MESONS. A. Alikhanyan, V. Kirillov-Ugryumov, N. Shostakovich, V. Fedorov, and G. Merzon. Translated from Doklady Akad. Nauk S.S.S.R. 92, 915-17(1953). 4p. (NSF-tr-214)

An abstract of this paper appears in Nuclear Science Abstracts as NSA 8-1662.

2241
REST MASS ENERGY OF THE NEGATIVE PION. R. C. Cornelius, C. P. Sargent, M. C. Rinehart, L. M. Lederman, and K. Rogers. (Columbia Univ., New York). Phys. Rev. 92, 1583(1953) Dec. 15.

A cloud-chamber photograph of a π^- meson coming to rest in H_2 (19 atm.) has been obtained, which was suitable for a determination of the π^- rest-mass energy. The reaction observed was interpreted to be $\pi^- + p \rightarrow n + e^- + e^+$. A rest energy of 137.3 ± 0.9 Mev was measured, corresponding to a mass equivalent of $268.8 \pm 1.8\ m_e$. (K.S.)

2242
MASS MEASUREMENTS OF PRIMARIES OF S EVENTS BY A MOMENTUM-RANGE METHOD. W. B. Fretter, B. P. Gregory, R. Johnston, A. Lagarrigue, H. Meyer, F. Muller, and C. Peyrou (École Polytechnique, Paris, France). Phys. Rev. 92, 1583-4(1953) Dec. 15.

Data on the primary and secondary particles of seven S events observed in a large cloud chamber are reported. The nature of the observed events is discussed. (K.S.)

2243
DECAY-ELECTRON SPECTRUM OF THE μ MESON. J. H. Vilain and R. W. Williams (Mass. Inst. of Tech., Cambridge). Phys. Rev. 92, 1586-7(1953) Dec. 15.

The electron-decay spectrum of μ mesons has been studied in a special A-filled cloud chamber. The decay of π mesons in an anthracene counter provided a source of muons which were directly observed. Rigorous selection criteria were established in choosing muons and decay electrons. Results are compared with the direct-interaction theory of μ decay into an electron and two neutrinos. The spectrum is written as

$$P(E)dE = \frac{4E^2}{W^4}\left[3(W-E) + 2\rho\,\frac{4}{3}E - W\right]dE.$$

Using $m_\mu = 207.0 \pm 0.6\ m_e$, $P = 0.50 \pm 0.12$, and therefore the spectrum does not go to zero at the end point. (K.S.)

NUCLEAR PHYSICS

2244
Laboratory for Nuclear Science, Mass. Inst. of Tech.
COSMIC RAY GROUP; ELEMENTARY PARTICLE SCATTERING GROUP; AND NEUTRON PHYSICS GROUP.

p.24-43 of PROGRESS REPORT NO. 31 [FOR] SEPTEMBER 1, 1953 TO NOVEMBER 30, 1953. Nov. 30, 1953. 20p. Contract N5ori-07806. (AECU-2810(p.24-43))

Two cases of S decay were found in which the related electron cascade developed in a direction not colinear with the charged decay product. A revision of the original Fermi model is proposed in order to account for the similarity in the energy spectra of all components of primary cosmic radiation. The spectrum of electrons from the decay of μ mesons may be written as $P(E)dE = (4E^2/W)\,[3(W-3) + 2\rho(\frac{2}{3}\,E-W)]\,dE$, where W is the maximum possible electron energy and ρ is a parameter which can have any value from 0 to 1, depending on the nature of the interaction assumed. Because of the comparatively high abundances of the reactions $(\gamma,2n)$, (γ,np), and even $(\gamma,2np)$, only an approximate value of the relative integrated (γ,n) cross section in Fe^{54} was obtained. Compared to the $Cu^{63}(\gamma,n)$ cross section, it appears to be 0.5 ± 0.1. Both 180° and 90° coincidences of the 0.6-Mev γ ray of Cu^{62} were measured to determine whether the γ ray is in cascade with the 2.92-Mev β^+ emitted by Cu^{62}. The ratio indicated the γ ray was not in cascade, and an isomeric state (lifetime more than ~10 μ sec.) in the Cu^{62} decay is suggested. The results obtained from the electric excitation of Ta, W, Pt, and Pb by protons in the energy range from 1 to 3 Mev are summarized. Additional data were obtained on the neutron inelastic scattering cross sections of Fe, Ni, Bi, Al, Pb, and Cr. (J.S.R.)

2245

Laboratory for Nuclear Science, Mass. Inst. of Tech. ONR GENERATOR GROUP AND RADIOACTIVITY GROUP. p.44-60 of PROGRESS REPORT NO. 31 [FOR] SEPTEMBER 1, 1953 TO NOVEMBER 30, 1953. Nov. 30, 1953. 17p. Contract N5ori-07806. (AECU-2810(p.44-60))

Accurate measurements and final assignments of proton groups resulting from the deuteron bombardment of thin films of Formvar, polyethylene, and nylon were completed. Q-values of the $C^{12}(d,p)C^{13}$, $C^{13}(d,p)C^{14}$, $N^{14}(d,p)N^{15}$, and $O^{16}(d,p)O^{17}$ reactions and the excitation energies of C^{13}, C^{14}, N^{15}, and O^{17} are tabulated. Three excited states of C^{13} from the $B^{10}(\alpha,p)C^{13}$ reaction were found at 3.09, 3.68, and 3.85 Mev. The results of the 17.3-Mev proton bombardment of $N_6C_3H_6$ showed that the Q-value of the $N^{14}(p,n)O^{14}$ ground state is -6.03 ± 0.20 Mev, with an O^{14} mass defect of 12.2 Mev. There do not appear to be any levels in O^{14} below 5.5 Mev. The following energy levels were observed in Al^{27} from the $Al^{27}(p,p)Al^{27}$ reaction: 0.85, 1.01, 2.21, 2.73, 2.98, 3.00, 3.68, 3.95, 4.05, 4.40, 4.51, 4.58, 4.80, 4.97, 5.12, 5.24, 5.42, 5.43, 5.50, 5.55, 5.67, 5.83, and 5.96 Mev. Resonance curves for the $m = \pm 1$ transition of the positronium ground state obtained in He, A, Kr, and freon 12 at pressures from $\frac{1}{3}$ to $\frac{4}{3}$ atm. display no variation of the field with either pressure or nature of the gas. The width of the line appears to be $\sim \Delta H/H = 4 \times 10^{-3}$, and the ground state splitting is $\Delta W = 203{,}370 \pm 50$ Mc. The graphed measurement of the possible coincidence activity in Ca^{48} shows a possible peak at 4.1 ± 0.4 Mev. This would correspond to double β decay with a meson lifetime of $7 \pm 2 \times 10^{16}$ yr. The energy distribution of the Co^{60} γ ray back-scattered from Al of various areas and thicknesses is graphed. (J.S.R.)

2246

Laboratory for Nuclear Science, Mass. Inst. of Tech. CYCLOTRON GROUP; SYNCHROTRON GROUP; AND THEORETICAL GROUP. p.61-78 of PROGRESS REPORT NO. 31 [FOR] SEPTEMBER 1, 1953 TO NOVEMBER 30, 1953. Nov. 30, 1953. 18p. Contract N5ori-07806. (AECU-2810(p.61-78))

The performance of the particle-selective counter was checked by observing the reaction particles from a C^{12} + H^1 target bombarded with 15-Mev deuterons at an angle of 30° from the incident deuteron beam. Preliminary data indicate a cross section of 34×10^{-30} cm^2/steradian for the photoproduction of π^0 from He. Attempts to observe μ-meson pair production by 345-Mev bremsstrahlung continued. From the value of the form factor for a Be target at 45° and the value for the upper limit to the cross section per nucleus at 45°, the cross section for the production of μ-meson pairs is less than $2 \times 10^{-13}/16\pi^2$ cm^2/steradian^2/proton. In plates exposed to the Brookhaven 1.5-bev meson beam, one K meson was observed. Preliminary measurements gave it a mass value of 800 ± 200 m_e. (J.S.R.)

2247

INTERNAL CONVERSION ELECTRONS FROM COULOMB EXCITED Ta AND W. Torben Huus and Jørgen H. Bjerregaard (Univ. of Copenhagen, Denmark). Phys. Rev. 92, 1579-81(1953) Dec. 15.

Internal conversion electrons from Ta and W were investigated by Coulomb excitation from 2.00- and 1.75-Mev protons, respectively. In addition to K_1, L_1, and M_1 peaks, the Ta spectrum clearly showed K_2 and L_2 lines, corresponding to the first step in the cascade transition from the second excited state. The quantum energies were found to be 137 and 166 kev, respectively, yielding a second-state excitation energy of 303 kev. It is shown, from these results, that the two transitions are about 85% M1, and the transition probability for M1 γ radiation, in terms of the ground-state nuclear moment corresponds to 2.8 nm. Four sharp peaks in the spectrum of W with no corresponding K lines are taken to mean that the peaks are E2 transitions in the abundant even-A isotopes. (K.S.)

NUCLEAR PROPERTIES

2248

Wisconsin Univ. MEASUREMENT OF THE NEUTRON-PROTON CROSS SECTION AT 1.0 AND 2.5 MEV. R. E. Fields, R. L. Becker, and R. K. Adair. [1953]. 31p. [Contract No. AT-11-1-GEN-7]. (AECU-2814)

The total cross section of H for 1.0- and 2.5-Mev neutrons was determined by measuring the neutron transmission of samples of 2,2,4-trimethylpentane and graphite. Electrostatically analyzed protons from an electrostatic generator were used to bombard thin targets of T absorbed in Zr to produce 2.5-Mev neutrons and thin targets of Li_2O to produce 1.0-Mev neutrons. A gas-filled recoil counter served as neutron detector. For both cross section determinations, the geometry of the measurement was such that neutrons scattered from the samples at angles greater than 4.2° in the laboratory system were not detected. A pulse-height discriminator, biased to reject pulses from low-energy neutrons, reduced the background from room-scattered neutrons to less than 1% and eliminated effects of low-energy neutron groups from the Li(p,n) reaction and the $O^{18}(p,n)$ reaction. Neutron energy spreads, primarily caused by the finite target thicknesses, were determined by measuring the widths of narrow neutron scattering resonances in S and C. The results of the cross section measurements are: $\sigma = 2.525 \pm 0.009 \times 10^{-24}$ cm^2 at a neutron energy of 2.540 Mev, and $\sigma = 4.228 \pm 0.018 \times 10^{-24}$ cm^2 at a neutron energy of 1.005 Mev. These values, together with the values of $\underline{a}_t$, $\underline{a}_s$, and $\underline{\rho}_t$ given by Burgy, Ringo, and Hughes, yield values of the singlet effective range in the shape-independent approximation of $2.48 \pm 0.20 \times 10^{-13}$ cm from the 2.5-Mev measurement and $2.56 \pm 0.25 \times 10^{-13}$ cm from the 1.0-Mev observations. These effective ranges are consistent with the proton-proton scattering data and the hypothesis of the charge independence of nuclear forces. (auth)

2249
Los Alamos Scientific Lab.
AVERAGE NEUTRON TOTAL CROSS SECTIONS IN THE 3- TO 12-MEV REGION. Norris Nereson and Sperry Darden. [1954]. 11p. [Contract W-7405-eng-36]. (AECU-2817)

Measurements of the average neutron total cross sections of N, F, Mg, P, Cl, Ti, Mn, Co, Ni, Zn, Se, Br, Mo, Ag, Cd, Sn, Sb, Te, La, Ta, W, Au, Hg, and Tl have been made over the 3- to 12-Mev energy range. The average energy spread of the measurements is approximately 10% and the over-all accuracy of the results is ±10% or better. The data, together with those of a previous experiment, provide information on average cross section behavior as a function of energy and atomic weight over most of the periodic table. (auth)

2250
Radiation Lab., Univ. of Calif., Berkeley
THE VARIATION OF HIGH-ENERGY TOTAL NEUTRON CROSS SECTIONS WITH ENERGY (thesis). Boris Ragent. Aug. 28, 1953. 44p. Contract W-7405-eng-48. (UCRL-2337)

The total neutron cross sections for C, Fe, Sb, and Ta have been measured in the region of 35 to 180 Mev in a good geometry absorption experiment using time-of-flight instrumentation developed for the 184-in. cyclotron. Tantalum exhibits a shallow dip in the cross section curve in the region of 50 to 70 Mev. It is apparent within the statistics that Sb has a dip in this region and that Fe and C also show unexpected behavior at these energies. (auth)

2251
Radiation Lab., Univ. of Calif., Berkeley
DECAY PROPERTIES OF Am^{243} AND POSSIBLE ROTATIONAL BANDS IN THE ALPHA SPECTRA OF ODD-EVEN NUCLEI. Frank Asaro and I. Perlman. Jan. 8, 1954. 6p. Contract W-7405-eng-48. (UCRL-2450)

A close similarity is shown in the α spectra of Am^{243} and Am^{241} insofar as comparison is possible, and an interpretation of some of the observed levels is made. Rotational bands in the α spectra of odd-even nuclei are discussed. (J.E.D.)

2252
THE NUCLEAR SPIN QUANTUM NUMBER OF Si^{29} ISOTOPE. Richard A. Ogg, Jr. and James D. Ray (Stanford Univ., Calif.). J. Chem. Phys. 22, 147(1954) Jan.

The nuclear-spin quantum number of Si^{29} was resolved by a study of the spin-spin interaction splitting of the proton magnetic resonance of SiH_4. Confirmation of the value of $\frac{1}{2}$ for the spin was attained. (J.A.G.)

NUCLEAR REACTORS

*2253
Hanford Works
SOME ASPECTS OF GRAPHITE MODERATED REACTOR COOLING. [G. M. Roy and G. Locke]. [May 21, 1953]. Decl. with deletions Dec. 28, 1953. 7p. (AECD-3615)

Heat transfer problems associated with the design of Pu-producing reactors of the graphite-moderated type are discussed, and some of the engineering considerations used in a practical design are mentioned briefly. (J.S.R.)

*2254
Knolls Atomic Power Lab.
ENGINEERING DEVELOPMENT PROBLEMS IN ATOMIC POWER PLANTS. G. S. Mikhalapov, K. A. Kesselring, and T. Trocki. [1953] 19p. (AECU-2755)

The various phases in the development of a commercially successful atomic power plant are discussed. The problems that require the most development and experimental work are outlined. Reactor cooling considerations and mechanical design, heat transfer studies, heat exchanger fabrication and pump development are reported. (J.E.D.)

*2255
Argonne National Lab.
RECALIBRATION OF CP-2 AND ITS USE FOR INHOUR MEASUREMENTS. J. L. Hyde, P. D. Deans, D. J. Pellarin, and G. W. McManaway. Nov. 1953. 25p. Contract W-31-109-eng-38. (ANL-5152)

An accurate calibration of the control rod for x below 240 cm was necessitated by the decrease in reactivity of the Argonne Graphite Reactor with age. For this purpose the regulating rod has been partially recalibrated. The differential inhour curve of 1943 (dih/dx vs. x) has been verified. The fact that the integral curve (ih vs. x) is slightly in error will not affect ordinary measurements in which only inhour differences are determined. An analytical expression covering the range x = 160 to 280 cm has been fitted to the 1943 curve $ih = 3.9272 - 0.13405x + 0.001208x^2$. This expression permits interpolation to 4 decimal places over this range, and is convenient to use instead of a calibration table. The barometric coefficient of reactivity has been redetermined directly and corrected by an approximate method to yield a figure of −0.260 ih/mb. This is believed to be as accurate as the previous value, −0.245 ih/mb. Since inhour measurements are not very sensitive to the value of this coefficient, the use of either figure should give satisfactory results. Tentative values, suitable for current use, have also been determined for flux distribution, statistical weights, galvanometer drift factor, and pile sensitivity. (auth)

*2256
Argonne National Lab.
DETERMINATION OF URANIUM BURNUP BY NOMOGRAPHS. F. R. Taraba. Dec. 1953. 8p. Contract W-38-109-eng-38. (ANL-5183)

A series of nomographs has been constructed to solve the burnup equation $B = E(1-e^{-\sigma\phi t})$, where B = % burnup of U atoms, E = % U^{235} enrichment, σ = thermal neutron cross section for fission of U^{235} in cm^2, ϕ = thermal neutron flux in neutrons/cm^2/sec, t = time of irradiation in sec. Although the burnup equation is explicitly solved for the variable B, it is none the less true that, if any three of the variables ϕ, t, B, and E are known, the value for the remaining variable may be found most easily by means of the nomographs. The use of the nomographs is described, and example problems are given to illustrate the procedure for solving the burnup equation. Included is an explanation of the important features of construction of the nomographs and a brief evaluation of their limitations. (auth)

*2257
North American Aviation, Inc.
OPERATION OF A WATER BOILER NEUTRON SOURCE. M. E. Remley. Nov. 20, 1953. 34p. Contract AT-11-1-GEN-8. (NAA-SR-839)

A low-power homogeneous reactor of the water boiler type, which was designed primarily as a research reactor, is described in some detail. Some of the operational characteristics and experimental uses at power levels up to 1 w are given. The operational history has pointed out the usefulness and versatility of the reactor as a tool for a great many varied research programs. (auth)

PARTICLE ACCELERATORS

2258
Proton Synchrotron Group, European Council for Nuclear Research
LECTURES ON THE THEORY AND DESIGN OF AN ALTERNATING GRADIENT PROTON SYNCHROTRON. Presented by members of the CERN Proton Synchrotron Group at the

Conference Held at the Institute of Physics of the University of Geneva, Geneva, Switzerland. Oct. 26-27-28, 1953. 180p. (NP-5070)

Studies on the general behavior of particles in an alternating-gradient synchrotron and on designs for the various components for such an accelerator are reported. A sample design for a 30-Bev accelerator on the basis of the above studies is proposed. (J.A.G.)

2259

Instituto di Fisica dell'Università, Rome

ALIGNMENT ERRORS IN THE STRONG FOCUSING SYNCHROTRON. Matthew Sands and Bruno Touschek. [1952?]. 15p. (NP-5073)

A method is presented for the treatment of errors in alignment between the sectors of a strong-focusing accelerator. Motion in one lateral coördinate only is treated, and the individual sectors are assumed to be ideal. It is found that if the ideal orbits (without misalignments) are periodic in one revolution, the effect of the misalignments is to produce unbounded orbits, but that away from such resonances stable orbits exist. Estimates are made of the alignment tolerances required for reasonable amplitudes of the perturbed motion. The essential features of the results are independent of the detailed nature of the guide field so long as the ideal orbits are stable. (auth)

RADIATION ABSORPTION AND SCATTERING

2260

Armed Forces Special Weapons Project

SPECTRAL DISTRIBUTION OF GAMMA RAYS PROPAGATED IN AIR. L. D. Gates, Jr. and C. Eisenhauer. Jan. 1954. 119p. (AFSWP-502A)

Theoretical calculations are presented for the spectral distribution of γ rays in an infinite homogeneous medium emanating from geometrically idealized sources. The sources considered here are isotropic sources uniformly filling all space (approximation to conditions at the center of a large radioactive cloud), isotropic sources uniformly distributed on an infinite plane (approximating conditions due to ground contamination), and an isotropic point source (approximating initial radiation from an atomic detonation). In the latter two cases, distributions are given at various distances from the source or source plane. Graphical material is presented in the form of differential energy spectra for monoenergetic sources of various energies. These spectra give the energy density of scattered radiation per unit energy range of the individual photons. Derived from these spectra are integral energy and integral dose curves, which give the fraction of energy (or dose) carried by γ rays whose energy is at most a given value. Also presented are curves which can be used to calculate integral dose spectra for sources composed of several energies. The calculations were based on the so-called "method of moments," and the mathematical explanation underlying this method is presented in some detail. (auth)

2261

Consolidated Vultee Aircraft Corp.

AIR SCATTERING OF GAMMA RAYS FROM A Co^{60} SOURCE. A COMPARISON OF THEORY WITH EXPERIMENT. C. H. Bernard. Aug. 20, 1953. 27p. (CVAC-171; FZK-9-052)

A 70-c Co^{60} γ source was used in conjunction with a non-directional anthracene dosimeter to measure air scattering. The experimental results were then used to make a comparison study to determine the accuracy with which single-scattering theory could predict dose rates. The dose rate was found to be inversely proportional to the source-detector separation distance as predicted by theory for distances between 30 and 70 ft. When the source-detector system is 45 ft or more above ground, the measured dose rate is almost wholly due to air scattering. This makes available a method by which ground scattering can be determined experimentally. (auth)

2262

Consolidated Vultee Aircraft Corp.

ANGULAR NEUTRON SCATTERING CROSS SECTIONS FOR AIR. G. S. Weller and B. J. Workman. Dec. 4, 1953. 14p. (MR-A-342)

The angular elastic scattering cross sections in air for neutrons of 0.3, 1.0, and 3.0 Mev were calculated. The calculations were based on an average air nucleus, the radius of which was calculated from the expression $R = 1.5 \times 10^{-13} A^{1/3}$ cm, where A is the weighted mean atomic weight for air. Results are tabulated. (J.A.G.)

2263

Radiation Lab., Univ. of Calif., Berkeley

ANGULAR DISTRIBUTION OF 30.6 MEV PROTONS ELASTICALLY SCATTERED BY Be, C, AND Al. Byron T. Wright. Nov. 1953. 13p. Contract No. W-7405-eng-48. (UCRL-2422)

The measurements extend from about 11 to 150° for each element. In a plot of R = σ (observed)/σ(Rutherford) vs. θ, the characteristic maxima and minima are present. R reaches 50 at 33° in Be, 35 at 80° in C, and 8.5 at 60° in Al. Between 120 and 150°, the mean differential cross sections are 0.5 ± 0.1, 0.95 ± 0.15, and 0.85 ± 1.15 mb for Be, C, and Al, respectively. (auth)

RADIATION EFFECTS

*2264

Knolls Atomic Power Lab.

INTERSTITIAL CONTENT OF RADIATION DAMAGED METALS FROM PRECISION X-RAY LATTICE PARAMETER MEASUREMENTS. 1. PRINCIPLES OF THE MEASUREMENTS. C. W. Tucker, Jr. and J. B. Sampson. Jan. 26, 1954. 22p. Contract No. W-31-109 Eng-52. (KAPL-1037)

An x-ray method for determining the interstitial content of irradiated metals is suggested and analyzed. This approach offers the following advantages: (a) the x rays "see" mainly the interstitial atoms since their effect outweighs that of vacancies by a 5 to 1 ratio, (b) the interpretation is straightforward and may be made quantitative, and (c) the method is sensitive since 0.1 at. %, and perhaps less, of interstitials may be detected. These conclusions are based upon a combination of theory and experiment. The theory is based upon an elasticity interpretation which predicts Vegard's law and several other experimentally confirmed x-ray effects. The possibilities of the method are confirmed by preliminary observations of x-ray-detected lattice expansions of several neutron-irradiated metals. (auth)

*2265

Oak Ridge National Lab.

MAGNETIC SUSCEPTIBILITY OF ANNEALED AND FAST-NEUTRON BOMBARDED GERMANIUM. D. K. Stevens. Mar. 4, 1954. 37p. Contract No. W-7405-eng-26. (ORNL-1599)

A balance was designed and constructed with sufficient sensitivity and precision to measure differential forces of 10^{-3} to 10^{-4} dynes in the presence of 1000-dyne forces exerted in the same direction. Accessory equipment for the measurement of the magnetic susceptibility of Ge was also assembled. The magnetic susceptibilities of 6 annealed and 3 fast-neutron-bombarded single-crystal cubes of Ge were measured as functions of temperature from liquid-N temperatures to room temperature. The effect of fast-neutron bombardment was detected in one p-type sample. Relative to the unirradiated specimen, the effect was that of decreased diamagnetism at low temperature and was in

accord with predicted results from Hall coefficient and electrical conductivity studies. The radiation effect was not detected in n-type samples, presumably because of insufficient concentration of carriers and suspected inhomogeneity. Therefore, the nature of the radiation-produced electron traps was not discernible. These results indicate that further work in this field would require the use of n-type specimens with higher carrier concentration and of longer periods of irradiation. (auth)

RADIOACTIVITY

2266

Mound Lab.

DECAY AND GROWTH TABLES FOR THE NATURALLY OCCURRING RADIOACTIVE SERIES. H. W. Kirby. July 1, 1953. 28p. Contract AT-33-1-GEN-53. (MLM-859)

Numerical values of $e^{-\lambda t}$, from t equals one minute to t equals 100 days, are given to four decimal places for each of the nuclides comprising the three naturally occurring radioactive series. Tables are included showing the growth of decay products from initially pure parent materials (Th^{228}, Ra^{224}, Ra^{226}, Pb^{210}, Ac^{227}, and Th^{227}). (auth)

2267

CROSS TERMS IN ALLOWED-SHAPE β SPECTRA. II. J. P. Davidson (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro, Brazil). Phys. Rev. 92, 1584-5(1953) Dec. 15. (cf. NSA 7-6295)

The possible mixture of (S, V) terms in the β-decay interaction is experimentally less well determined than the limits of the (T, A) mixture. A major difficulty is that all the transitions certain to contain Fermi parts in the interaction ($\Delta I = 0$, no) have very short half lives, on the order of seconds. The recently discovered isomeric transition in Cl^{34} provides a fortunate exception to this rule. The 33-min state of Cl^{34} goes about half the time by γ emission to a $J = 0^+$ ground state of Cl^{34}; this state makes a pure Fermi (0−0) transition to the ground state of S^{34}. Although this β transition has an intrinsic half life of about 1.5 sec, it is governed by the 33-min half life of the isomeric parent. Because of branching in the β-decay scheme, only the upper 2.2 Mev of the 4.5-Mev spectrum can be used. It can also be noted that the spectrum shape is a more sensitive measure of the admixture terms than the electron-neutrino correlation function, provided that the admixture is small. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

*2268

Ames Lab.

A LOW TEMPERATURE DILATOMETRIC STUDY OF SOME RARE EARTH METALS. F. Barson, S. Legvold, and F. H. Spedding. Aug. 1953. 64p. Contract W-7405-eng-82. (ISC-424)

A sensitive dilatometer was designed and constructed. Employing the principle of interference of light, this dilatometer made possible the measurement of changes in length on the order of 10^{-5} cm. The coefficients of linear thermal expansion of several rare earth metals were determined between 100 and 340°K. The metals tested and their coefficients of linear thermal expansion at room temperature are given. The trend seems generally to be toward an increase in the coefficient of expansion with increasing atomic number, the only exception being Gd, which is anomalously low at room temperature due to the Curie point of this metal at 289°K. Dysprosium also exhibited this extraordinarily low coefficient of expansion in the region of a magnetic anomaly at 175°K. Below room temperature, the coefficients of expansion of these metals decreased in value. Exceptions to this general rule were Pr and Nd, whose expansion increased slightly below about 220°K. The limits of error were estimated from the probable errors in the experimental readings and from the reproducibility obtained between successive runs on the respective metals. (auth)

SHIELDING

2269

Naval Research Lab.

A TECHNIQUE FOR MEASURING THE EFFECTIVENESS OF VARIOUS SHIELDING MATERIALS. H. E. Dinger and J. E. Raudenbush. Jan. 22, 1953. 14p. (NRL-4103)

A technique has been devised whereby the shielding effectiveness against both high- and low-impedance electromagnetic fields can be measured for small samples of any desired materials, including such nonhomogeneous constructions as wire mesh and conductive coatings. The samples are inserted between two shield cans containing small transmitting and receiving elements, and the attenuation is determined by a ratio of the energies reaching the receiving element with and without the inserted sample. The measured values obtained for several homogeneous samples compared favorably with those obtained by calculation. Practical considerations limited the measurable attenuation range to approximately 110 decibels, depending on frequency and equipment sensitivity. Measured values are given for a number of commonly used materials. (auth)

SPECTROSCOPY

2270

Chalk River Project (Canada)

THE DESIGN OF A CHAMBER SUITABLE FOR ARCING VARIOUS MATERIALS IN AIR-FREE ATMOSPHERES. G. Zotov. Dec. 4, 1952. 11p. (PDB-68)

A chamber is described which is suitable for arcing various materials in any suitable atmosphere. Previous experience with similar equipment indicates successful application of this model to spectrographic analysis. (auth)

2271

Radiation Lab., Univ. of Calif., Berkeley

THE RADIATIONS OF AcK. Earl K. Hyde. Jan. 27, 1954. 25p. Contract No. W-7405-eng-48. (UCRL-2470)

The γ rays of AcK (Fr^{223}) were studied in a NaI-photomultiplier scintillation counter coupled to a 50-channel pulse-height analyzer. Photons of a 49.8-kev γ ray appear in 40 ± 10%, and photons of an 80-kev γ ray appear in 24 ± 6% of the total β disintegrations. In addition, low-intensity γ rays appear at 215 and 310 kev. L x radiation is present in about the same intensity as the 49.8-kev γ ray. Gamma-gamma coincidence studies proved that the 49.8- and 80-kev radiations were not in coincidence. It was also shown that the 215- and the 50-kev γ rays are not in coincidence. The L x radiation was studied in a proportional counter coupled to a 50-channel analyzer and identified as Ra x rays. Since Th^{227} decays to the same daughter as does Fr^{223}, some measurements were made on its γ spectrum. Prominent photopeaks were observed at 49.8, 87, and 235 kev. The 235- and 49.8-kev γ rays were observed to be in coincidence. The known decay data for Fr^{223} and Th^{227} cannot be fitted into a common decay scheme without additional information. (auth)

THEORETICAL PHYSICS

2272

Los Alamos Scientific Lab.

SCATTERING THEORY AND ITS APPLICATIONS. Kenneth M. Watson and Keith A. Brueckner — John McIntosh, ed. [1953] 102p. Contract W-7405-eng-36. (AECU-2765)

A general development of the theory of transition rates and scattering cross sections is presented from a quantum point

of view. These notes were taken from a series of lectures which followed the work of Lippman and Schwinger concerning the invariance requirements on S-matrix formulation, the connection between time-dependent and time-independent representations, and later attempts to establish a firm theoretical foundation for more recent results. A discussion of these problems and considerations of the Schwinger integral equation, the Breit-Wigner equation, time-reversal theory, final state interactions, and the theorem of detailed balancing are used as a basis for analyzing more specialized aspects of meson and nucleon theory. (K.S.)

URANIUM AND URANIUM COMPOUNDS

2273

Laboratory for Nuclear Science, Mass. Inst. of Tech.
A RADIOCHEMICAL STUDY OF FISSION YIELDS IN THE REGION OF SHELL PERTURBATIONS AND THE EFFECT OF CLOSED SHELLS IN FISSION. (TECHNICAL REPORT NO. 63). Alexis C. Pappas. Sept. 15, 1953. 182p. Contract AT(30-1)-905. (AECU-2806)

A radiochemical determination of fission yields and a study of the fine structure in the heavy mass peak in fission of U^{235} with thermal neutrons are presented. A survey of the knowledge of the fission process is given, together with information on the problems that will be investigated. A detailed study of the techniques and radiochemical methods used is presented. Improved methods for the chemical separation of fission-product Te and I are given. A completely new method was worked out for isolation and purification of fission-product Sb in less than 4 min. As determination of fission yields depends on the measurement of the β activity of the nuclide of interest, the technique of absolute β counting was investigated in detail. It was possible to improve considerably the accuracy of absolute β counting using end-window Geiger-Mueller tubes. A thorough investigation of the fission-product decay chains in the mass range 129 through 140 is reported. Six new isotopes of Sb have been discovered and characterized. These are: 1.2h Sb^{128}, 12m Sb^{130}, 23.1m Sb^{131}, 1.9m Sb^{132}, 4.1m Sb^{133}, and 0.8m $Sb^{134,135}$. In accordance with theoretical predictions, nuclear isomerism was shown to exist in Te^{133}, and a decay scheme for the transition 63m $Te^{133m} \rightarrow$ 2m $Te^{133} \rightarrow$ 22.4h I^{133} is given. Improving of old half lives and determination of decay energies were performed for different isotopes of Te and I. Cumulative, and in some cases independent fission yields were measured for all isotopes of Sb, Te, and I in, respectively, the mass ranges 127 through 133, 129 through 134, and 131 through 135, and for Ba^{139}. All these yields are given relative to Ba^{140}, which was used as a fission monitor. The yields of isotopes of Xe^{131} through Xe^{134} and $Ce^{133,135,137}$ measured by other workers in the field as relative yields with the mass spectrometer were normalized to the new fission yield of chain 131, 3.02%, so that all nuclides in the mass range 129 through 140 reported are on the same absolute scale. The effects of closed shells in fission were studied. Studies on closed-shell effects in β energetics were used in the study of the distribution of primary nuclear charge in fission. The old postulate given by L. E. Glendenin has been changed to account for the discontinuities in neutron and proton binding energies arising from closed nuclear shells. The most probable charge division is the one that leads to equal charge displacements for the initial fission fragments from their final stability characteristic for their mass number. All the available experimental data fall on a smooth charge distribution curve based on this postulate. Neutron binding energies have been computed in the region of closed shells on the basis of available α- and β-decay energies. It is shown that besides the already known effects of closed shells these will also result in an abnormal dependence of the neutron binding energy of shell (S) plus 1, 3, 5, and 7 neutrons on the number of protons in the nucleus. These results have been used to predict the emission of both prompt and delayed neutrons from fission fragments. It has been shown that nuclides with neutron numbers S + 1, 3, 5, and 7 will emit the last neutron promptly and thus result in fine structure in the yield mass curve. This fine structure is further accentuated by the emission of delayed neutrons. The fission yields predicted on this basis are in good agreement with the observed ones along different decay chains and for different mass numbers, except at chain 135. It seems required that 82 neutron species are favored in the primary fission process recently measured experimentally in other investigations. (auth)